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SUPPLEMENT

TO THE

ENCYCLOPÆDIA.

Electrometer.

ELECTROMETER, is an inſtrument which meaſures the quantity of electricity in any electrified body. The moſt common electrometers are deſcribed in the article ELECTRICITY (*Encycl.*), n° 27, and 182—233. A very valuable one is likewiſe deſcribed in n° 85. of the article ELECTRICITY in this Supplement; but there are ſtill two electrometers, of which we have hitherto given no account, though they are of ſuch value, that to paſs them unnoticed would be unpardonable. The firſt, which is by much the moſt accurate and delicate inſtrument of the kind that we have ſeen, was invented by Mr Coulomb, and is adapted to aſcertain the ſmalleſt quantity of redundant electricity. The ſecond is a late invention of Mr Cuthbertſon, the ingenious improver of the air-pump, and is employed only to meaſure the charge of large jars and batteries.

ELECTROMETER, by *Mr Coulomb* of the Royal Academy of Sciences at Paris, deſcribed in the Memoirs for 1785.

Mr Coulomb had made ſome experiments in examination of Dr Hooke's theory of ſprings "*ut tenſio ſic vis*;" and found, that it was ſurpriſingly exact, in regard to the force neceſſary for twiſting elaſtic wires. Having ſuſpended a nicely turned metal cylinder by a fine wire in the direction of its axis, and having given it ſeveral turns, and left it to regain its natural poſition, he obſerved, that it performed all its revolution of untwiſting and twiſting in times preciſely equal, whether theſe oſcillations were of a few degrees, or conſiſted of ſeveral revolutions. He thence concluded, that the force with which the wire endeavoured to regain its natural poſition was exactly proportional to its diſtance from it. Engaged, ſoon after, by order from the Miniſter of Marine, in an examination of the phenomena of the mariner's compaſs, he took this method of ſuſpending his needles, in order to obtain exact meaſures of the forces which cauſed them to deviate from the magnetic meridian. He made ſome obſervations with needles ſo ſuſpended; which are highly valuable to the philoſopher engaged in that ſtudy. When his ſucceſs in this reſearch had fully gratified his wiſhes, he turned his thoughts to the examination of the law of electric action by the help of an electrometer ſuſpended in the ſame manner. It is conſtructed as follows:

Plate XXVII.

ABDC (fig. 1.) repreſents a glaſs cylinder, 12 inches in diameter and in height. This is covered by a glaſs plate fitted to it by a projecting fillet on the under ſurface. This cover is pierced with two round holes of $1\frac{1}{4}$th inches in diameter. One of them *f* is in the centre, and it receives the lower end of the glaſs tube *f h*, of 24 inches height, which is fixed in the hole with a cement made of ſealing-wax, or other electric ſubſtance. The top of this tube receives the braſs collar H (fig. 2. n° 3.), bored truly cylindrical, and having a ſmall ſhoulder, which reſts on the top of the tube. This collar is faſtened with cement, and receives the hollow cylinder Φ (fig. 2. n° 2.), to which is joined the circular plate *a b*, divided on the edge into 360 degrees. It is alſo pierced with a round hole G in the centre, which receives the cylindrical pin *i* (fig. 2. n° 1.), having a milled head *b*, and an index *i o*, whoſe point is bent down, ſo as to mark the diviſions on the circle *a b*. This pin turns ſtiffly in the hole G, and the cylinder Φ turns ſteadily in the collar H. To the lower end of the centre pin is faſtened a little pincer *q*, formed like the end of a port-crayon, and tightened by the ring *q*, ſo as to hold faſt the ſuſpenſion wire, the lower end of which is graſped by a ſimilar pincer P*o* (fig. 3.), tightened by the ring φ. The lower end φ *o* is cylindrical, and it is of ſuch weight as to ſtrain the wire perfectly ſtraight, but without any riſk of breaking it. It may be made half of the weight that will juſt break it.

This pincer is enlarged at C, and pierced with a hole, which receives tightly the arm *g* C *q* of the electrometer. This is eight inches long, and conſiſts of a dry ſilk thread, or ſlender ſtraw of ſome graſs completely dried, and dipped in melted gum lac or fine ſealing-wax, and held upright before a clear fire, till it form a ſlender cylinder of about $\frac{1}{10}$th of an inch in diameter. This occupies ſix of the eight inches, from *g* to *q*: the remaining two inches is a fine thread of the lac or ſealing-wax, as it drains off in forming the arm. At *a* is a ball of pith of elder or fine cork, one-fourth or one-half of an inch in diameter, made very ſmooth, and gilded. It is balanced by a vertical circle *g* of paper, of large dimenſions, ſtiffened with varniſh. The reſiſtance of the air to this plane ſoon checks the oſcillations of the arm.

The whole is ſeen in its place in fig. 1. where the arm hangs horizontally about the middle of the height of the great cylinder. In its oſcillations the ball *a* moves round in a circle, whoſe centre is in the axis of the whole inſtrument. Its ſituation is indicated by a graduated circle Z O Q, drawn on a ſlip of paper, and adhering to the glaſs with varniſh. The electrified body, whoſe action is to be obſerved, is another ſmall ball of cork *t*, alſo gilt, or a braſs ball well poliſhed. This is carried by a ſtalk of gum lac *m* φ, incloſing a dry ſilk thread. This ſtalk is graſped by a clamp of cleft deal, or any ſimilar contrivance which lies firm on the glaſs cover. When this ball is let down through the hole *m*, it ſtands ſo as to touch the ball *a* on the arm when that ball is oppoſite *o* on the graduated circle.

To electrify the ball *t*, we employ the inſulating handle, fig. 4. which is a ſlender ſtick of ſealing-wax or lac, holding a metal wire that carries a ſmall poliſhed metal ball. We touch with it ſome electrified body, ſuch as the prime conductor of a machine, the knob of a jar, &c. Introduce this electrified ball cautiouſly into the hole *m*, and touch the ball *t* with it. The ball *a* is immediately repelled, and goes to a diſtance, twiſting the ſuſpenſion-wire, till the force of twiſt exerted by the wire balances the mutual repulſion of the balls *t* and *a*.

Such is the proceſs for examining the law of electric action. But when we would examine the action of different bodies in different ſtates, another apparatus is wanted. This is repreſented by the piece *cAd* (fig. 5.), conſiſting of a plug of ſealing-wax A, which fits tight into the hole *m*, and is pierced by the wire *c d*, hooked at *c*, to receive a wire connecting it occaſionally with an electrified body, and having below a poliſhed metal ball *d*.

The inſtrument is fitted for obſervation in the following manner: Turn the milled button *b* at top, till the twiſt-index *i o* is on the mark *o* of the twiſt circle. Then turn the whole in the collar H, till the ball *a* ſtands oppoſite to the mark *o* of the paper circle *z* OQ, and at the ſame time touches the ball *t* or *d*.

The obſervation is made thus: The ball *t* is electrified as already ſaid, and *a* is repelled, and retires from *t*, twiſting the wire, and, after a few oſcillations, ſettles at a diſtance correſponding to the repulſion. Now turn the twiſt-index, ſo as to force the ball *a* nearer to *t*. We eſtimate the force of this new repulſion by adding the motion of the twiſt-index to the angle at which the ball firſt reſted. By turning the twiſt-index ſtill more, we bring the balls ſtill nearer, and have a meaſure of another repulſion.—And thus may we obtain as many meaſures as we pleaſe.

In this way Coulomb aſcertained the relation between the repulſion and the diſtance to be the inverſe duplicate ratio of the diſtances. He diſcovered the law of diſſipation by air in contact, and the relation which this bears to the primitive repulſion, by obſerving the gradual approach of *a* to *t* as the electricity diſſipates from both, and by ſlackening the twiſt-index till the ball *a* retires to its primitive diſtance. He aſcertained the diſſipation along imperfect conductors, and the length neceſſary for inſulation, by completely inſulating the ball *t*, and obſerving the loſs by air in contact with it, and then ſliding a metal rod down the inſulating ſtalk, till the diſſipation began to exceed what took place by the air alone. He examined the proportion of redundant fluid in communicating bodies, by connecting them alternately with the piece, fig. 5.; as alſo by electrifying one ball, and obſerving its repulſive force, and then ſharing its electricity with another, and obſerving the diminution. He examined the graduation of his electrometer, by ſharing the electricity of one ball with an equal ball, which gave him the poſition that indicated one half; and, by repeating this, for one-fourth, &c. in the ſame manner as we practiſed and related in ELECTRICITY (*Suppl.*), n° 141, &c.

An example of one or two of thoſe trials will give a clear conception of the concluſions deduced from theſe obſervations.

The ball *t* was introduced and electrified; *a* was repelled, and ſettled at 40°; the index was twiſted 140°, which brought *a* to 20; and the time was noted. The electricity gradually diſſipated, and *a* came nearer to *t*. The index was untwiſted 30°, and *a* retired a little beyond 20°; but on waiting a few ſeconds, it ſtood exactly at 20°. The time was again noted. The interval was exactly three minutes. The concluſion from the experiment was as follows:

When the ball was brought to 20°, the repulſion was evidently 140 + 20, or 160. Three minutes afterwards it was 110, + 20, or 130; and 30° were loſt in three minutes, or 10° per minute. The mean force was 145. Therefore the mean loſs per minute was, $\frac{10}{145}$. Obſerve alſo, that the primitive force correſponding to the diſtance was 40: and the force correſponding to 20 was 160, or inverſely as 20^2 to 40^2,

But obſerve, that the diſtances were not meaſured by the angles, but by the chord of the angles. The obliquity of action muſt alſo be accounted for; and the real lever is leſs than the arm, in the proportion of radius to the coſine of $\frac{1}{2}$ the angle.

The wire uſed by Coulomb in his firſt experiments on the law of action was of ſuch ſtrength, that $\frac{1}{340}$th of a French grain, applied at the point *a*, held it faſt till the twiſt-index was turned 360°; ſo that one degree correſponded to $\frac{1}{122400}$ of a grain. A foot of this wire weighed $\frac{1}{16}$th of a grain. Experience having ſhewn that this was a ſenſibility far exceeding what was neceſſary for the meaſures that he had in view, and made the inſtrument too delicate for common uſes, he ſubſtituted much ſtronger and ſhorter wires, and recommends much ſmaller dimenſions for the whole inſtrument. We have made two of only five inches in diameter and 14 inches high; the arm *a g* being $2\frac{1}{2}$ inches, and the ſuſpenſion a ſingle fibre of ſilk, carrying 30 grains. It is far more ſenſible than Bennet's gold leaf electrometer. The ſame inſtrument, with a ſilver wire ſuſpenſion, and a thread of lac projecting from the end *g*, as an index to coincide more cloſely with the ſcale, is ſufficiently nice for all experiments of meaſurement. It is always proper to have the diameter of the cylinder double the length of the arm, that the action of the glaſs may not diſturb the poſition of the arm. It is greatly improved by having a round hole in the bottom of the inſtrument, in which the cylinder C *o* of the lower pincer may hang freely: this prevents much tedious oſcillation. For ordinary experiments, for meaſuring charges of batteries, and the like, a much leſs delicate inſtrument, with a ſuſpenſion-wire ſtrained at both ends, is abundantly delicate, and vaſtly more manageable. The wire ſhould extend as far below the arm as above it, and ſhould be graſped below, by a pincer turning by a milled head in a hole at the end of a ſlender ſpring. This enables us to adjuſt the inſtrument ſpeedily. Having placed the twiſt-index at o, turn this lower button gently till the ball *a* points exactly to o on the paper circle. Even in this coarſeſt ſtate we have found it more delicate, and much more exact, than the electrometer deſcribed in ELECTRICITY (*Suppl.*) n° 85. which was much more coſtly, and liable to accidents. Coulomb's electrometer has the great advantage of waſting very little electricity; whereas Henley's, or Brookes's, or de Luc's, waſte it very faſt when it is intenſe.

We improved it greatly by taking away the apparatus with the ball *t*, and ſubſtituting the piece, fig. 5. for it, after changing its conſtruction a little. Inſtead of the wire *c d*, we uſed the ſmalleſt glaſs tube that we could varniſh on the inſide, by drawing through it a ſilk thread dipped in varniſh. Having varniſhed it with lac both within and without, a braſs ball *d* was fixed on its lower end, and a fine wire, with a ball at top, was put down into the tube, ſo as to touch the ball below. When the plug was fitted into the hole *m* once for all, the ſituation of the ball *d* ſuffered no alteration. When delicate experiments are to be made, the upper ball *c* is touched by the charger, fig. 4. which electrifies *d*. C is immediately drawn out with a glaſs forceps; and thus *d* is left completely inſulated. When external electricity, ſuch as the faint electricity of the atmoſphere is to be examined, the wire is allowed to remain in the tube.—*N. B.* A ſcrupulous experimenter, who may object to the ſtraining ſpring recommended above, may ſubſtitute a ſmall weight, which will be conſtant in its action.

The reader will obſerve, that this electrometer, as hitherto managed, meaſures only repulſions. It is not ſo eaſy to meaſure attractions with it; and Mr Coulomb was obliged to take a very circuitous method, during which a great deal of electricity was diſſipated. In this reſpect, the electrometer deſcribed in the article ELECTRICITY (*Suppl.*) has the advantage; but in every other reſpect, Mr Coulomb's is the fineſt electrometer that has yet been publiſhed, giving *abſolute* meaſures, and this with great accuracy. The Hon. Mr Cavendiſh has employed the conſtruction in his moſt valuable experiments on the force of gravity (*Phil. Tranſ.* 1798, Part II.); an experiment which Newton would have been delighted with obſerving.

Cuthbertſon's ELECTROMETER is thus deſcribed by himſelf in the laſt number of the ſecond volume of *Nicholſon's Philoſophical Journal.* GH (fig. 6.) is an oblong piece of wood, about 18 inches in length, and ſix in breadth, in which are fixed three glaſs ſupporters, D, E, F, mounted with braſs balls, *a*, *c*, *b*. Of theſe ſupporters, E and F are exactly of the ſame length; but D is four inches ſhorter. Under the braſs ball *a* is a long braſs hook; the ball *c* is made of two hemiſpheres, the under one being fixed to the braſs mounting, and the upper turned with a groove to ſhut upon it, ſo that it can be taken off at pleaſure. The ball *b* has a braſs tube fixed to it, about three inches long, cemented on the top of F, and the ſame ball has a hole at the top, of about one-half inch diameter, correſponding with the inſide of the tube. AB is a ſtraight braſs wire, with a knife edged centre in the middle, placed a little below the centre of gravity, and equally balanced with a hollow braſs ball at each end, the centre, or axis, reſting upon a proper ſhaped piece of braſs fixed in the inſide of the ball *c*: that ſide of the hemiſphere towards *c* is cut open to permit the end *c* A of the balance to deſcend till it touches the ball *a*, and the upper hemiſphere C is alſo cut open to permit the end *c* B to aſcend; *i* is a weight, weighing a certain number of grains, and made in the form of a pin with a broad head; the ball B has two holes, one at the top, and the other at the bottom; the upper hole is ſo wide, as to let the head of the pin paſs through it, but to ſtop at the under one with its ſhank hanging freely in *b*; *k* is a common Henley's quadrant electrometer; and when in uſe it is ſcrewed upon the top of *c*.

It is evident, from the conſtruction, that if the foot ſtand horizontal, and the ball B be made to touch *b*, it will remain in that poſition without the help of the weight *i*; and if it ſhould by any means receive a very low charge of electric fluid, the two balls *b*, B, will repel each other; B will begin to aſcend, and, on account of the centre of gravity being above the centre of motion, the aſcenſion will continue till A reſt upon *a*. If the balance be ſet again horizonal, and the pin *i* be put into its place in B, it will cauſe B to reſt upon *b*, with a preſſure equal to that weight, ſo that more electric fluid muſt be communicated than formerly before the balls will ſeparate; and as the weight in B is increaſed or diminiſhed, a greater or leſs quantity of electric fluid will be required to effect a ſeparation.

When this inſtrument is to be applied to a jar, or battery, one end of a wire L muſt be inſerted into a hole in *b*, and the other end into a hole of any ball proceeding from the inſide of a battery, as M. A chain, or wire, or any body through which the charge is to paſs, muſt be hung to the hook at *m*, and carried from thence to the outſide of the battery, as is repreſented by the line N. *k* muſt be ſcrewed upon *c*, with its index towards A. The reaſon of this inſtrument being added, is to ſhew, by the index continuing to riſe, that the charge of the battery is increaſing, becauſe the other part of the inſtrument does not act till the battery has received its required charge.

It is almoſt needleſs to obſerve that this inſtrument conſiſts of three electrometers, viz. Henley's electrometer, Lane's diſcharging electrometer conſiderably improved, and Brookes's ſteelyard electrometer improved likewiſe. By this combination and theſe improvements, we poſſeſs all that can be required in an electrometer for batteries and large jars; for, by *k*, we ſee the progreſs of the charge; by the ſeparation of B *b*, we have the repulſive power in weight; and by the ball A, the diſcharge is cauſed when the charge has acquired the ſtrength propoſed.

In the journal from which this abſtract is taken, the reader will find ſome curious experiments made with batteries by means of this electrometer; but one will be ſufficient to explain its uſe. Prepare the electrometer in the manner ſhewn in the figure, with the jar M annexed, which contains about 168 ſquare inches of coating. Take out the pin in B, and obſerve whether the ball B will remain at reſt upon *b*; if not, turn the adjuſting ſcrew at C till it juſt remains upon A. Put into B the pin, marked *i*, weighing 15 grains; take two inches of watch-pendulum wire, fix to each end a pair of ſpring tongs, as is repreſented at G *m*, hook one end to *m*, and the other to the wire N, communicating with the outſide of the jar; let the uncoated part of the jar be made very clean and dry; and let the prime conductor of an electrical machine, or a wire proceeding from it, touch the wire L; then, if the machine be put in motion, the jar and electrometer will charge, as will be ſeen by the riſing of the index of *k*; and when charged high enough, B will be repelled by *b*, and A will deſcend and diſcharge the jar through the wire which was confined in the tongs, and the wire will be fuſed and run into balls. The ingenious author, by breathing through a glaſs pipe into the jar, damped it a little in the inſide. Then loading B with a pin of 30 grains, he obtained ſuch a charge as fuſed eight inches of watch pendulum wire, diſpoſed exactly as the two inches were diſpoſed in the former experiment. By repeating and varying his experiments, he found that double quantities of electrical fluid, in the form of a diſcharge, will melt four times the length of wire of a certain diameter.

ELECTROPHORUS. See Electricity in this *Supplement*.

ELEPHAS, the Elephant. See *Encyclopædia;* where the natural hiſtory of this huge and ſagacious animal is detailed at conſiderable length. Since that article was publiſhed, we have ſeen the third volume of the Aſiatic Reſearches, in which ſome important queſtions, which we were then obliged to leave in uncertainty, ſeem to be decided by John Corſe, Eſq. They relate, *1ſt*, To the mode in which elephants copulate; which Buffon aſſerts (and in proof of his aſſertion adduces the ſtructure and poſition of the generative organ in the female) to be performed while that female remains recumbent on the back; but which Mr Corſe inſiſts, from ocular evidence, takes place after the manner in which the horſe copulates with the mare. *2d*, To the method of receiving nouriſhment from the mother; which is not, as Buffon avers, by the trunk, but by the mouth, which ſucks the dug, while the trunk of the young animal graſps it round to preſs out the milk. *3d*, To the period of their going with young; which Mr Corſe conceives cannot be leſs than two years; whereas Buffon and Pennant aſſign only nine months for the geſtation of their young. His reaſons for this ſuppoſition are unanſwerable, and ſhall be given in his own words.

"As far as I know, the exact time an elephant goes with young has not yet been aſcertained; but it cannot be leſs than two years, as one of the elephants brought forth a young one twenty-one months and three days after ſhe was taken. She was obſerved to be with young in April or May 1788, and ſhe was only taken in January preceding; ſo that it is very likely ſhe muſt have had connection with the male ſome months before ſhe was ſecured, otherwiſe they could not have diſcovered that ſhe was with young, as a fœtus of leſs than ſix months cannot well be ſuppoſed to make any alteration in the ſize or ſhape of ſo large an animal. The young one, a male, was produced October 16, 1789, and appeared in every reſpect to have arrived at its full time. The gentleman to whom it belongs examined its mouth a few days after it was brought forth, and found that one of its grinders on each ſide had partly cut the gum."

When Mr Corſe wrote his memoir, the young elephant was active and well, and beginning to eat a little graſs. In Africa the Hottentots feed on the elephant; and M. Vaillant declares, that an elephant's foot, when baked in their manner, is a moſt delicious morſel.

ELEPHANTIASIS (ſee Medicine, n° 352. *Encycl.*) is one of the moſt dreadful maladies with which the human race is any where afflicted. It is not indeed common, if it be found at all, in the temperate climates of Europe; but it is frequent in the Eaſt and Weſt Indies, where it too often baffles the ſkill of the ableſt phyſicians. In the ſecond volume of the Aſiatic Reſearches we have the following preſcription for its cure:

"Take of fine freſh white arſenic one tólá, or 105 grains; of picked black pepper ſix times as much: let both be well beaten at intervals for four days ſucceſſively in an iron mortar, and then reduced to an impalpable powder in one of ſtone with a ſtone peſtle, and thus completely levigated, a little water being mixed with them. Make pills of them as large as tares or ſmall pulſe, and keep them dry in a ſhady place. One of thoſe pills muſt be ſwallowed morning and evening with ſome betel leaf, or in countries where betel is not at hand, with cold water: if the body be cleanſed from foulneſs and obſtructions by gentle cathartics and bleeding before the medicine is adminiſtered, the remedy will be ſpeedier."

This preſcription, we are told, is an old ſecret of the Hindoo phyſicians, which they conſider as a powerful remedy againſt all corruptions of the blood, whether occaſioned by the elephantiaſis or the venerial diſeaſe, which they call the *Perſian* fire, and which they apply likewiſe to the cure of cold and moiſt diſtempers, or palſy, diſtortions of the face, relaxation of the nerves, and ſimilar diſeaſes. As the Hindoos are an ingenious and ſcientific people, it might be worth ſome European phyſician's while to make trial of this ancient medicine in the Weſt Indies, where the elephantiaſis or kindred diſeaſes prove ſo frequently fatal.

ELEVATION, in architecture, denotes a draught or deſcription of the principal face or ſide of a building; called alſo its *upright* or *orthography*.

ELEUTHERA, or *Alabaſter*, one of the Bahama or Lucaya iſlands, where above 60 families formerly ſettled under Dep. Gov. Holmes, and erected a ſmall fort.—*Morſe.*

ELIAS, Mount St. a mountain near the ſhore of the N. W. coaſt of North-America, N. W. of Admiralty bay, and S. E. of Prince William's ſound.—*ib.*

ELIZABETH CITY *Co.* in Virginia, lies between York and James rivers, having Warwick and York counties on the W. and Cheſapeak bay on the E. and N. There are ſeveral ſmall iſlands on its ſea-coaſt, the chief of which are Long and Egg iſlands. Point Comfort is the S. eaſtern extremity of the co. It contains 3450 inhabitants, of whom 1876 are ſlaves.—*ib.*

Elizabeth *Iſlands*, ſeveral ſmall iſlands on the S. E. ſide of Buzzard's bay, extending S. weſterly from the extremity of Barnſtable co. in Maſſachuſetts, and bearing N. W. from Martha's Vineyard; ſituated between 41. 24. and 41. 32. N. lat. and between 70. 38. and 70. 56. W. long. They are about 16 in number; the chief of which are Naſhawn, Paſqui, Naſhawenna, Pinequeſe, and Cattahunk iſlands. All theſe belong to Duke's county.—*ib.*

Elizabeth, a ſhort ſouthern arm of James river in Virginia. It affords an excellent harbor, and large enough for 300 ſhips. The channel is from 150 to 200 fathoms wide; and at common flood tide it has 18 feet water to Norfolk, which ſtands near the mouth of its eaſtern branch. The S. branch riſes in the Diſmal Swamp. Craney iſland, at the mouth of Elizabeth, lies 5 miles S. W. of Point Comfort, at the mouth of James river.—*ib.*

Fig. 1.

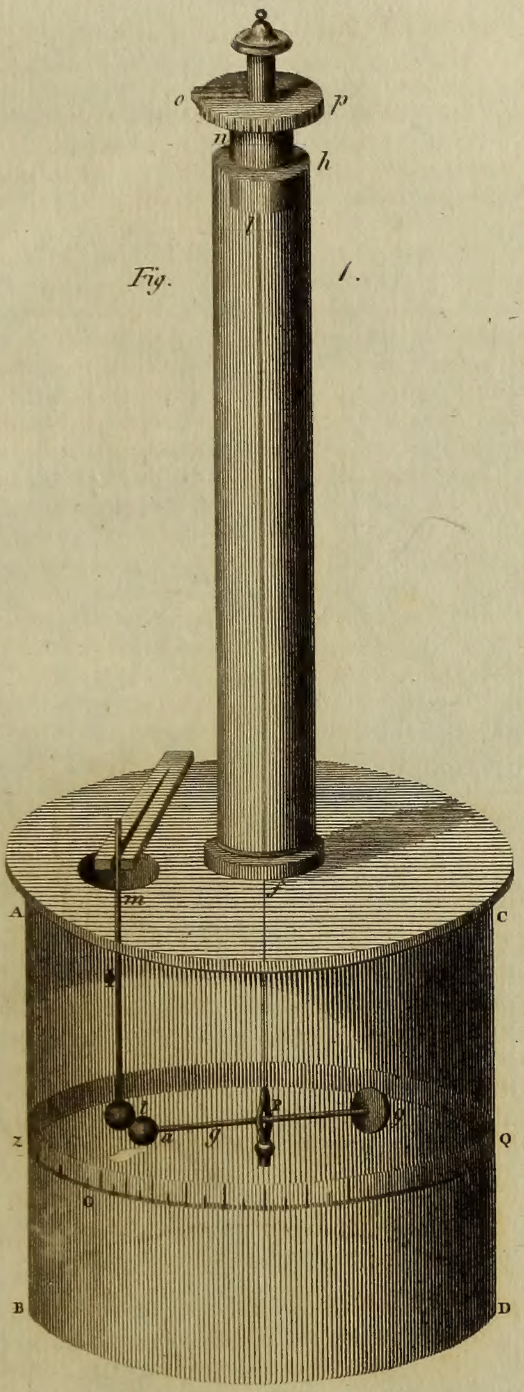


Fig. 5.

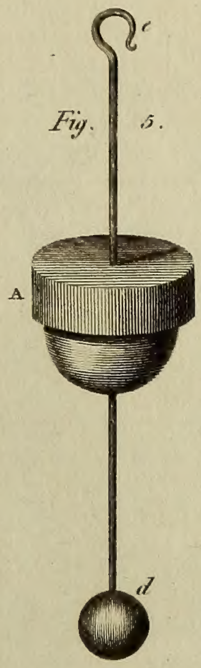


Fig. 2.

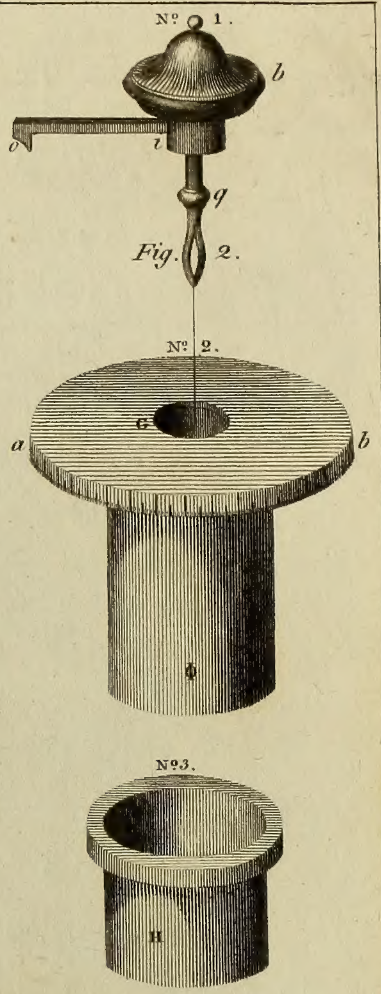


Fig. 4.

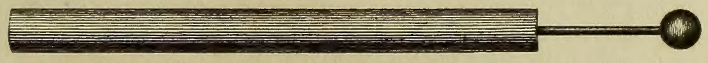


Fig. 3.

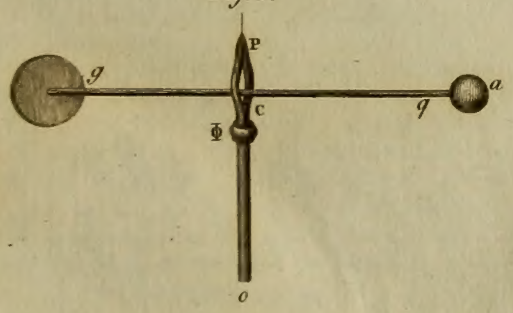
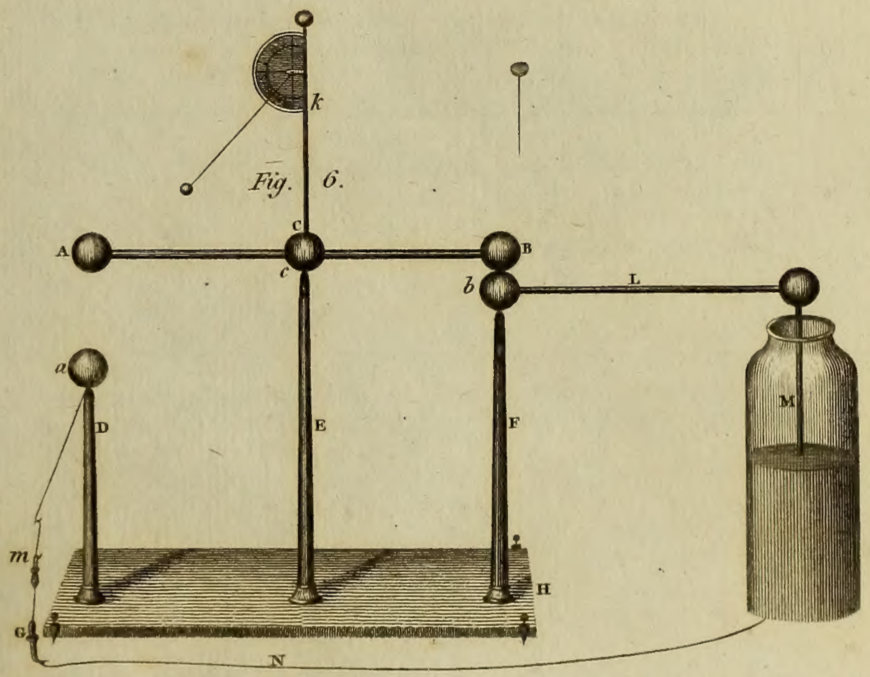


Fig. 6.



Lawson sc.

Elizabeth's Island, Queen, in the ſtraits of Magellan, in S. America. Here freſh water, herbs fit for ſallad, and wild fowl may be had in great plenty. The ſhores alſo abound with ſhell-fiſh.—*ib.*

Elizabeth, a townſhip in Lancaſter co. Pennſylvania, containing about 30 houſes, and a Dutch church; 18 miles N. W. by W. of Lancaſter, and 84 W. by N. of Philadelphia.—*ib.*

ELIZABETHTOWN, a poſt town and borough, in Eſſex county, New-Jerſey; pleaſantly ſituated on a ſmall creek which empties into Arthur Kull. Its ſoil is equal to any in the ſtate. In the compact part of the town, there are about 150 houſes, two brick churches, one for Preſbyterians, very handſome, the other for Epiſcopalians, and an academy. This is one of the oldeſt towns in the ſtate, having been purchaſed of the Indians as early as 1664, and ſettled ſoon after. It lies 6 miles ſoutherly of Newark, and 15 S. W. by W. of New-York.—*ib.*

Elizabethtown, a village of Alleghany co. Pennſylvania, ſituated on the S. E. ſide of Monongahela river between Redſtone Old Fort and Pittſburg, about 18 miles from each, and 6 above the mouth of the Youghagany. Many boats are built here for the trade and emigration to Kentucky, and in the environs are ſeveral ſaw-mills. N. lat. 40. 13. W. long. 79. 22—*ib.*

Elizabethtown, a poſt town of Maryland, and capital of Waſhington co. formerly called Hagarſtown, ſeated in the fertile valley of Conegocheague. It has ſeveral ſtreets regularly laid out. The houſes are principally built of brick and ſtone, in number about 300. Epiſcopalians, Preſbyterians, and German Lutherans have each a church. The court-houſe and market-houſe are handſome buildings, and the gaol is of ſtone, and ſubſtantial. The trade with the weſtern country is conſiderable; and there are a number of mills in the neighbourhood, on Antietam creek.—*ib.*

Elizabethtown, the chief town of Tyrrel co. in Edenton diſtrict, North-Carolina, has a gaol, court-houſe, and a few dwelling-houſes. It is 40 miles from Fayetteville, and 55 from Wilmington.—*ib.*

Elizabethtown, a poſt town and the chief in Bladen co. N. Carolina, is ſituated on the N. W. branch of Cape Fear. It contains a court-houſe, gaol, and about 30 houſes; 36 miles ſouthward of Fayetteville, and 47 N. W. of Wilmington.—*ib.*

ELK, a creek in Northumberland co. Pennſylvania, which uniting with Penn's creek, falls into the Suſquehanna, 5 miles below Sunbury.—*ib.*

Elk, a navigable river of the eaſtern ſhore of Maryland, which riſes in Cheſter co. Pennſylvania, by two branches; Big and Little Elk creeks. At their confluence ſtands Elkton. The canals in contemplation from Elk river, to Delaware bay, are noticed under Delaware bay.—*ib.*

Elk, a ſhort navigable river, in the ſtate of Tenneſſee. It riſes on the N. W. ſide of Cumberland mountain, runs S. weſterly, and falls into the Tenneſſee a little above the Muſcle ſhoals; about 40 miles W. N. W. of the Creeks' Croſſing Place.—*ib.*

Elkhorn, a ſmall water of Kentucky river. The Elkhorn lands are much eſteemed, being ſituated in a bend of Kentucky river, in Fayette co. in which this ſmall river, or creek, riſes.—*ib.*

Elk, *Lake*, one of the chain of ſmall lakes which connects the lake of the Woods with lake Superior. N. lat. 48. 41. W. long. 93.—*ib.*

Elkridge, a ſmall town in Ann Arundel co. Maryland, ſituated on the S. bank of Patapſco river, and on the W. ſide of Deep Run. This place is famous for the bright tobacco called *kite's foot*. It is 8 miles S. W. of Baltimore, and 19 N. W. of Annapolis. N. lat. 39. 12. 30.—*ib.*

Elkton, a poſt town of conſiderable trade, at the head of Cheſapeak bay, in Maryland, and the capital of Cecil co. It is ſituated at the confluence of the head branches of Elk river, 13 miles from its mouth at Turkey Point, and a mile above French town. The tide flows up to the town, and it enjoys great advantages from the carrying trade, between Baltimore and Philadelphia. Upwards of 250,000 buſhels of wheat are collected here annually, for ſupplying thoſe markets, or the neighbouring mills. Elkton conſiſts of one ſtreet, in which are about 90 houſes, a court-houſe, and gaol. On the W. ſide of the town is an academy. It is 12 miles S. W. of Chriſtiana bridge, 10 N. E. of Charleſtown, 47 S. W. of Philadelphia, and 56 N. E. of Baltimore.—*ib.*

ELLINGTON, a townſhip of about 200 families, in Tolland co. Connecticut. It lies about 12 miles N. E. of Hartford city, and 6 W. of Tolland.—*ib.*

ELLIPSE, or **Ellipsis**, is one of the conic ſections, popularly called an *oval*; being called an *ellipſe* or *ellipſis* by Apollonius, the firſt and principal author on the conic ſections, becauſe in this figure the ſquares of the ordinates are *leſs* than, or *defective* of, the rectangles under the parameters and abſciſſes. See *Conic Sections*, Encycl.

ELLIPSOID, is an elliptical ſpheroid, being the ſolid generated by the revolution of an ellipſe about either axis.

ELLIPTOIDE, an infinite or indefinite ellipſis, defined by the indefinite equation $ay^{m+n} = bx^{m}\,\overline{.a-x}^{\,n}$ when m or n are greater than 1: for when they are each = 1, it denotes the common ellipſe.

There are ſeveral kinds or degrees of elliptoides, denominated from the exponent $m+n$ of the ordinate y. As the cubical elliptoide, expreſſed by $ay^3 = bx^2\,\overline{.a-x}$; the biquadratic, or furſolid $ay^4 = bx^2\,\overline{.a-x}^{\,2}$; &c.

ELMORE, the ſouthernmoſt townſhip in Orleans co. in Vermont; and contained, by the cenſus, only 12 inhabitants.—*Morſe.*

EMERY's *River*, a ſmall river in Tenneſſee, which runs S. E. into the Tenneſſee, 7 miles N. by E. of the mouth of Clinch river.—*ib.*

EMINENTIAL equation, a term uſed by ſome algebraiſts, in the inveſtigation of the areas of curvilineal figures, for a kind of aſſumed equation that contains another equation eminently, the latter being a particular caſe of the former.

EMMAUS, a Moravian ſettlement, 8 miles from Bethlehem, in Pennſylvania.—*Morſe.*

EMMITSBURGH, or *Emmitſburgh*, a flouriſhing village in Frederick co. Maryland, ſituated between Flat Run and Tom's creek, weſtern head waters of the Monococy, and about a mile S. of the Pennſylvania line. It is 24 miles N. E. by E. of Frederick, and 50 N. W. of Baltimore. N. lat. 39. 10. 30. —*ib.*

ENAMELLING of Vessels for the Kitchen. In the year 1779 the Society of Emulation in Paris propoſed as a prize queſtion "To diſcover a compoſition fit for making kitchen utenſils which ſhould be free from the diſadvantages attending copper, lead, tinned veſſels, glazed earthen ware, &c. which ſhould be as ſtrong as poſſible, leſs coſtly than the veſſels uſed at preſent, and which ſhould be able to bear the higheſt degree of kitchen fire, and the moſt ſudden changes from heat to cold."

In conſequence of this propoſal, Mr Sven Rinman of the Royal Acadamy of Stockholm, without any intention of being a candidate for the premium offered by the Society of Emulation, inſtituted a ſet of experiments on ſmall veſſels of copper and hammered iron, with the view of giving to them a coating of what may properly be called *enamel*, which ſhould not have the defects of tinning, and which, when applied to iron, ſhould take from it the inconveniency of ruſting, and of blackening many ſorts of victuals when they are dreſſed in it. Theſe experiments he ſubmitted to the academy of which he was a member; and as we think them important, we ſhall lay the ſubſtance of them before our readers.

The moſt common, and the cheapeſt kind of white enamel that is to be met with in the ſhops (which is an opaque white glaſs, compoſed of powdered quartz, of glaſs of lead, and of calx of tin), was tried for coating kitchen utenſils; and he found that it was excellent for the purpoſe, as it produced a coating, which was not only clean and agreeable in its appearance, but poſſeſſed likewiſe all the power of reſiſting the action of fire and of acids that could be deſired. But, as it is very difficult to apply, is very dear for common uſe, and is beſides conſidered as not being capable of reſiſting violent blows or falls, he made various experiments with ſubſtances of leſs price; of which the following are certainly worthy of being related.

1. The white ſemi-tranſparent fluor ſpar was reduced into a fine powder, with an equal quantity of unburnt gypſum, and afterwards calcined in a ſtrong fire with a white heat; the whole being, from time to time, carefully ſtirred. The veſſel, which he intended to coat, having firſt been wetted by dipping it in water, had as much of the aforeſaid powder applied to its inſide, by means of a very fine ſilk ſieve, as would adhere to it of itſelf, or could be made to do ſo by preſſing it with the finger. After this veſſel had been dried and gradually heated, it was expoſed to a ſudden and violent heat, partly in a coal-fire, kept up by a pair of bellows (the veſſel being at the ſame time covered, ſo that no coals or aſhes could fall into it,), and partly in an aſſaying furnace.

In the coal fire, and with the heat as violent as is commonly uſed to make copper ſolder run, the mixture was melted, in about the ſpace of a minute, into an opaque white enamel, which evenly covered the ſurface of the copper, and fixed itſelf pretty firmly to the metal; it alſo bore hard blows without breaking, and reſiſted the trials made by boiling things in it, and by applying acids to it. The forementioned mixture was alſo reduced into a fine powder in a glaſs mortar, and made into a ſort of thin paſte with water; it was then applied to the veſſel with a ſmall bruſh, an operation as eaſy as that of applying any other wet colouring matter. He likewiſe tried this paſte, by covering veſſels with it in the ſame way the potters apply their common glazing for ſtone ware. By both the above mentioned proceſſes he obtained a very ſmooth coating, particularly by the latter, which is more quickly performed. When the paſte is applied, the veſſel ſhould be made a little warm, ſo alſo ſhould the paſte itſelf.

If the conſtituent parts of theſe two ſubſtances be conſidered (that is to ſay, that gypſum is compoſed of calcareous earth ſaturated with vitriolic (ſulphuric) acid, and fluor ſpar of a particular acid united to ſiliceous earth; alſo, that the whole, when put into the fire without the addition of any other ſubſtance, is, of all earthy or ſtony mixtures, that which the moſt eaſily melts into an opaque white glaſs, not very brittle) and if, on the other hand, the action of acids be attended to—we ſhall eaſily conceive theſe ſubſtances muſt attach themſelves ſtrongly to copper, and that the varniſh formed by them cannot afterwards be diſſolved or acted upon by acids.

The greateſt difficulty attending on this ſimple mixture is, the ſtrong and ſudden heat neceſſary to apply it with effect, that heat being greater than is commonly to be obtained in an aſſaying furnace. On that account, M. Rinman endeavoured to render it more fuſible by the addition of ſome other ſubſtance.

Of his experiments made with this view, ſome failed, and others ſucceeded. We ſhall record only ſuch as were ſucceſsful, and at the ſame time attended with ſuch moderate expence as not to preclude them from common uſe.

2. With the ſubſtances employed in his firſt experiment, which, with the author, we ſhall henceforth call n° 1. he mixed an equal quantity of what is called *fuſible glaſs (vitrum fuſibile)*, compoſed of ſix parts of lime, four of fluor ſpar, two of quartz reduced into a fine powder, and one-tenth of a part of manganeſe; the whole having been calcined, and ground with water, in the manner colours are ground, he ſpread it on the veſſel with a bruſh. This mixture ran pretty well upon the copper in the coal fire; it alſo attached itſelf very ſtrongly to it, and produced an enamel which was firm and hard, and ſeemed likely to bear wear; but it was of a dark grey colour, and without any brilliancy. The mixture did not melt more readily in the aſſaying furnace.

Two parts of n° 1. with one part of the fuſible glaſs, and a quarter of a part of manganeſe, had nearly the ſame effect. This laſt mixture, indeed, was rather more eaſily melted, but it had a darker colour.

3. Eight parts of n° 1. with one half of a part of borax, one quarter of a part of nitre, and half a part of manganeſe, were melted, in the ſpace of ten minutes, into a brown liver-coloured glaſs; which, in the aſſaying furnace, produced upon the copper veſſel a black enamel, which had a dull ſurface. In other reſpects it was firm, even, and hard; but it did not ſufficiently cover the veſſel by a ſingle application, nor was it capable of reſiſting the action of acids.

4. One part of the brown glaſs mentioned in the laſt experiment, with three parts of n° 1. became, in the aſſaying furnace with a red heat, almoſt as fluid as the laſt, and had an even and ſmooth ſurface; but it was of

a dark colour, and had not any brilliancy. It was not ſenſibly acted upon by vitriolic (ſulphuric) acid.

5. Four parts of n° 1. mixed with one half of a part of litharge, were melted in a crucible, with the help of the bellows, in five minutes, ſo as to become as fluid as water. This mixture, during the fuſion, emitted a ſmell of ſulphureous acid, and formed an opaque glaſs of a ſtraw colour; which, after being ground, as uſual, and ſpread upon a copper veſſel, produced an enamel which covered the veſſel very evenly, and was without bubbles. It was likewiſe, perhaps the hardeſt of all, but could not be melted in the aſſaying furnace, requiring a ſtronger fire kept up by the bellows. It preſerved its ſtraw colour, but without any luſtre, and reſiſted the action of acids better than the common glazing of the potters.

6. Mr Rinman mixed together equal quantities of gypſum, fluor, ſpar, and what the potters call *white lead* (A). and which ſerves for the baſis of their glazing. This mixture, after being calcined, melted in five minutes, with the aſſiſtance of a pair of bellows into a very white, hard, and opaque enamel, which was very eaſily poured out of the crucible. This enamel, treated like the others, ran very freely, equally, and without bubbles, by the heat of the aſſaying furnace. It was alſo pretty hard and ſtrong, but without any luſtre, and had green and yellow ſpots, occaſioned by the acids of the gypſum and fluor ſpar, which had acted upon the copper during the fuſion of the enamel. It, however, bore melting two or three times, and then appeared of a white colour; it was but very little affected by other acids.

7. Equal parts of fluor ſpar, of gypſum, of litharge, and of pure flint glaſs, powdered and mixed together, melted in five minutes, by the help of a pair of bellows, and produced a white and hard glaſs, very like that of the laſt experiment, but rather harder. After being applied on the veſſel in the uſual manner, it formed, with the greateſt heat of an aſſaying furnace, an enamel of a yellowiſh white colour, firm and hard, but without luſtre. In order to avoid the formation of bubbles, care was taken (as ought always to be done in enamelling) to remove the veſſel from the fire as ſoon as it had acquired a brilliant appearance therein, or as ſoon as the enamel was completely melted.

8. Twelve parts of glaſs of lead or of litharge, with eight parts of flint glaſs, and two of flowers of zinc, were melted, in the ſpace of ſeven minutes, into a clear yellow glaſs, which, when uſed for enamelling, was diſpoſed to form bubbles; but, by continuing the heat for a longer time, the bubbles were diſperſed, and he obtained a pretty good enamel, of a yellow brown colour with a greeniſh caſt, very hard and firm. It reſiſted the action of the vegetable acids, like the enamels already ſpoken of, but it was a little attacked by the mineral acids.

9. He powdered and mixed together five parts of fluor ſpar, five parts of gypſum, two parts of minium, one half of a part of borax, two parts of flint glaſs, one half of a part of calx of tin, and only one twenty-fifth of a part of calx of cobalt. This mixture was melted in a crucible in ſix minutes, by help of the bellows, and produced an opaque glaſs of a pearl colour, a little inclining to blue, on account of the calx of cobalt. It was pretty hard, and, after being ground with water in the uſual way, it became of a very good conſiſtence, ſo as to be very fit for ſpreading over veſſels, to which it adhered very ſtrongly. If any bubbles formed on the veſſel during its drying, they might be rubbed down with the finger, and the whole ſurface rendered ſmooth and even. After being warmed, and gradually heated, it was put into an aſſaying furnace, made very hot with birch charcoal, which had been juſt kindled under the muffle. After a minute it melted, and began to appear brilliant; ſo that he found it neceſſary to take out the veſſel very quickly, which was already very evenly coated with a thick, and ſufficiently hard, enamel, the ſurface of which, however, had no brilliancy.

The colour remained always inclining to green, becauſe the copper had been a little attacked by the acids of the gypſum and fluor ſpar during the fuſion; but in other reſpects this enamel was very firm, was very little hurt by ſlight blows, and bore very well ſudden changes of heat and cold. Weak acids had no action upon it; but he had ſome reaſon to think that it would, in length of time, have been acted upon, to a certain degree, by vitriolic (ſulphuric) acid. Its colour, except the forementioned ſhade of green, was white, with a dull, and rather changeable, ſurface.

The calx of cobalt, which has been juſt mentioned, and which Mr Rinman made uſe of merely with the intention of obtaining a fine colour, was prepared by ſaturating a ſolution of cobalt in aquafortis (nitric acid) with common ſalt, and evaporating to dryneſs; by which means he obtained a fine roſe-coloured calx. A very ſmall quantity of this calx, when mixed with any fuſible glaſs, gives it a beautiful blue colour.

Of the various ſpecies of enamel, which have been deſcribed in the courſe of theſe experiments, and which may be all applied, with more or leſs advantage, to kitchen utenſils, the leaſt expenſive are n^{os} 1, 2, and 5.; but they are alſo thoſe which require the greateſt heat. On the other hand, n° 9 may be recommended as the moſt eaſy of fuſion, and, at the ſame time, very durable when uſed for coating veſſels in which victuals are to be dreſſed, which is here the principal object, and is of far greater importance than the brilliant appearance reſulting from the enamel generally uſed by artiſts, which however may be employed when the ſaving of expence is not regarded.

The enamels hitherto deſcribed are not applicable to veſſels made of iron, though they may be employed to cover copper with great advantage. Iron will not indeed bear the common practice of enamellers, namely, to be put into the fire and taken out again ſeveral times; for the ſparks which fly from iron, when in a hot fire, detach and carry off the enamel from the parts contiguous to thoſe where the ſparks are formed. The acids, too, of the gypſum and fluor ſpar, made uſe of in the enamels already mentioned, acted upon the iron during the fuſion of the enamel, from which reſulted bubbles and bare ſpots, which entirely ſpoiled the appearance of the work. Our author therefore continued his experiments with a view to diſcover a proper enamel for veſſels made of this metal.

10. He reduced into a very fine powder, and ground

(A) This ſubſtance is itſelf a mixture, being compoſed of four parts of lead and one of tin.

together, nine parts of minium (red oxyd of lead), ſix parts of flint glaſs, two parts of pure potaſh, two parts of purified nitre, and one part of borax. This mixture was put into a large crucible, which it only half filled; he covered the crucible ſo that no coals could fall into it, and gradually increaſed the fire under it. When the efferveſcence had entirely ceaſed, he cauſed the mixture to melt, by uſing the bellows for four or five minutes; by theſe means he obtained a clear and compact glaſs, which he poured out of the crucible upon a piece of marble. Having quenched it in water, and reduced it to a very fine powder in a glaſs mortar, he ground it with water to the conſiſtence of a very thin paſte. He then covered an iron veſſel with it on both ſides, which, after having dried and heated it by degrees, he put under a muffle well heated in an aſſaying furnace. The enamel melted very readily in the ſpace of half a minute, and with a very brilliant appearance. He immediately withdrew the veſſel, and let it cool. It was found to be entirely coated with a beautiful enamel of a black colour; which colour appeared to be cauſed by a thin layer of calcined iron, which might be ſeen through the tranſparency of the enamel.

A copper veſſel, having been covered with the ſame enamel, the fine colour of the copper was viſible through the thin coat of glaſs; and it was as well defended from ruſt by this coating as it would have been by an enamel of a ſtronger kind.

11. To hinder the colour of the metal from being ſeen through the coating, he added to the mixture, uſed in the preceding experiment, only one hundredth part of the calx of cobalt deſcribed in n° 9. The whole was melted into a beautiful blue glaſs; it was prepared for enamelling, and applied, in the manner before deſcribed, upon another iron veſſel. The enamel proved to be ſmooth, thick and brilliant, like the preceding, but it covered the veſſel more perfectly; it was of a fine blue colour, with ſome black ſpots in thoſe parts where it had been moſt thinly applied.

12. The glaſs of n° 10. reduced into powder, and ground with potters white lead, of which mention has already been made, melted with the ſame facility; it produced a very ſmooth enamel, of a grey colour, but more firm and hard than the former, and, on account of the addition made to it, of a ſtill leſs price. By mixing with the ſame glaſs a ſmall quantity of crocus martis, he obtained a very fine enamel, of a dark red colour, not to mention other colours in it ſtill more beautiful. The crocus martis he uſed in this experiment was prepared from a ſolution of iron in aqua regia (nitro-muriatic acid), which was evaporated to dryneſs, and the matter thus edulcorated and calcined.

13. In order to render the forementioned enamel more ſolid, and to give it what is called *body*, he melted together a mixture of twelve parts of flint glaſs, eighteen parts of minium, four parts of potaſh, four parts of nitre, two parts of borax, three parts of calx of tin, and one eighth part of calx of cobalt, obſerving always the uſual precautions. He obtained a glaſs of a light blue colour, which, after having been ground with water, and ſpread upon ſmall iron baſins, or tea cups, produced, by means of a briſk fire in an aſſaying furnace, an enamel which was ſmooth and even, and of a pearl colour. The coating was of a proper thickneſs, to obtain which requires a certain degree of dexterity and practice. He alſo tried to paint upon this enamel with what is called *mineral purple (purpura mineralis)*, which he uſed with a little powdered quartz, nitre, and borax. It produced a very beautiful red colour.

Though this laſt mentioned compoſition is more beautiful when applied upon iron, and more even than the preceding, it has the diſadvantage, on account of the ſalts which it contains, of not reſiſting the action of the ſtronger vegetable acids, and ſtill leſs that of the mineral ones. But as a veſſel when coated with this enamel bears, without any injury, ſudden changes of heat and cold, and alſo to have any greaſy mixtures baked or boiled in it, (even thoſe which are of a cauſtic alkaline nature, or thoſe which contain the uſual weak acids which are uſed in the preparation of our food), it may be applied to veſſels of various kinds, among others to tea cups; particularly as it is neither brittle nor ſubject to crack, provided it is not expoſed to violent blows. It is hardly neceſſary to ſay, that this enamel can only be applied upon veſſels made of hammered iron, and not upon thoſe of caſt iron, theſe laſt being always too thick to be heated with ſufficient quickneſs: for the greater is the ſpace of time neceſſary to make the veſſels red hot, the greater is the quantity of ſcales formed upon them, and, of courſe, the enamel becomes more injured.

Our author makes ſome other judicious obſervations on the enamel for iron, of which he has deſcribed the compoſition, and ſays, that, independent of its uſe for coating kitchen utenſils, it might be made to ſerve many other purpoſes, ſuch as preſerving things made of that metal, not only from ruſt, but alſo, as he proved by experiment, to a certain degree, from calcination.

ENCAUSTIC PAINTING. See PAINTING in this *Supplement*.

ENDEAVOUR *Straits*, are between the N. point of New-Holland, and the S. coaſt of New-Guinea. S. lat. 10. E. long. from Paris 140.—*Morſe.*

ENFIELD (William, L. L. D.), well known in the learned world by ſeveral uſeful and elegant publications, was born at Sudbury, on March 29, O. S. 1741, of parents in a humble walk of life, but of very reſpectable characters. His amiable diſpoſition and promiſing talents early recommended him to the Rev. Mr Hextall, the diſſenting miniſter of that place, who took great care of his education, and infuſed into his young mind that taſte for elegance in compoſition which ever afterwards diſtinguiſhed him.

In his 17th year he was ſent to the academy at Daventry, then under the direction of the Rev. Dr Aſhworth, where he paſſed through the uſual courſe of inſtruction preparatory to the office of the miniſtry; and with ſuch ſucceſs did he cultivate the talents of a preacher, and of an amiable man in ſociety, that, on leaving the academy, he was at once choſen, in 1763, miniſter of the very reſpectable congregation of Benn's Garden in Liverpool.

In that agreeable town he paſſed ſeven of the happieſt years of his life, very generally beloved and eſteemed. He married, in 1767, the daughter of Mr Holland draper in Liverpool, with whom he paſſed all the reſt of his days in moſt cordial union. His literary reputation was extended, during his reſidence in this place, by the publication of two volumes of ſermons, which were very well received, and have ſerved to grace many pulpits beſides that in which they were originally preached. A collection of hymns and of family prayers, which he alſo publiſhed at Liverpool, did credit to his taſte and judgment.

About 1770, he was invited to take a ſhare in the conduct of the academy at Warrington, and alſo to occupy the place of miniſter to the diſſenting congregation there, both vacant by the death of the Rev. Mr Seddon. His acceptance of this honourable invitation was a ſource of a variety of mixed ſenſations and events to him, of which anxiety and vexation compoſed too large a ſhare for his happineſs. No aſſiduity on his part was wanting in the performance of his various duties; but the diſeaſes of the inſtitution were radical and incurable; and perhaps his gentleneſs of temper was ill adapted to contend with the difficulties, in matter of diſcipline, which ſeem entailed on all diſſenting academies, and which, in that ſituation, fell upon him, as the domeſtic reſident, with peculiar weight. He always, however, poſſeſſed the reſpect and affection of the beſt diſpoſed of the ſtudents; and there was no reaſon to ſuppoſe that any other perſon, in his place, could have prevented that diſſolution which the academy underwent in 1783.

During the period of his engagement there, his indefatigable induſtry was exerted in the compoſition of a number of works, moſtly, indeed, of the claſs of uſeful compilations, but containing valuable diſplays of his powers of thinking and writing. The moſt conſiderable was his "Inſtitutes of Natural Philoſophy" (quarto, Johnſon, 1783;) a clear and well-arranged compendium of the leading principles, theoretical and experimental, of the ſciences compriſed under that head. And it may be mentioned, as an extraordinary proof of his diligence and power of comprehenſion, that, on a vacancy in the mathematical department of the academy, which the ſtate of the inſtitution rendered it impoſſible to ſupply by a new tutor, he prepared himſelf, at a ſhort warning, to fill it up; and did fill it with credit and utility, though this abſtruſe branch of ſcience had never before been a particular object of his ſtudy. He continued at Warrington two years after the academy had broken up, taking a few private pupils.

In 1785, receiving an invitation from the principal diſſenting congregation at Norwich, he accepted it, and firſt fixed his reſidence at Thorpe, a pleaſing village near the city, where he purſued his plan of taking a limited number of pupils to board in his houſe. He afterwards removed to Norwich itſelf; and, at length, fatigued with the long cares of education, entirely ceaſed to receive boarders, and only gave private inſtructions to two or three ſelect pupils a few hours in the morning. This too he at laſt diſcontinued, and devoted himſelf ſolely to the duties of his congregation, and the retired and independent occupations of literature. Yet, in a private way and ſmall circle, few men had been more ſucceſsful in education, of which many ſtriking examples might be mentioned, and none more ſo than the members of his own family. Never, indeed, was a father more deſervedly happy in his children; but the eldeſt, whom he had trained with uncommon care, and who had already, when juſt of age, advanced in his profeſſional career ſo far as to be choſen town-clerk of Nottingham, was moſt unfortunately ſnatched away by a fever a few years ſince.

This fatal event produced effects on the doctor's health which alarmed his friends. The ſymptoms were thoſe of *angina pectoris*, and they continued till the uſual ſerenity of his mind was reſtored by time and employment. Some of the laſt years of his life were the moſt comfortable: employed only in occupations which were agreeable to him, and which left him maſter of his own time; witneſſing the happy ſettlement of two of his daughters; contracted in his living within the domeſtic privacy which he loved; and connected with ſome of the moſt agreeable literary companions, and with a ſet of the moſt cordial and kind-hearted friends that perhaps this iſland affords, he ſeemed fully to enjoy life as it flowed, and indulged himſelf in pleaſing proſpects for futurity. Alas! an unſuſpected and incurable diſeaſe was preparing a ſad and ſudden change: a ſchirrous contraction of the rectum, the ſymptoms of which were miſtaken by himſelf for a common laxity of the bowels, brought on a total ſtoppage, which, after a week's ſtruggle, ended in death. Its gradual approach gave him an opportunity to diſplay all the tenderneſs, and more than the uſual firmneſs, of his nature. He died November 3, 1797, amidſt the kind offices of mourning friends, and his laſt hours were peace!

Beſides the literary performances already mentioned, Dr Enfield completed, in 1791, the laborious taſk of an abridgment of "Brucker's Hiſtory of Philoſophy," which he compriſed in two volumes quarto. It may be truly ſaid, that the tenets of philoſophy and the lives of its profeſſors were never before diſplayed in ſo pleaſing a form, and with ſuch clearneſs and elegance of language. Indeed it was his peculiar excellence to arrange and expreſs other mens ideas to the utmoſt advantage. Perhaps, at the time of his deceaſe, there was not in England a more perfect maſter of what is called the middle ſtyle in writing, combining the qualities of eaſe, elegance, perſpicuity, and correctneſs, entirely free from affectation and ſingularity, and fitted for any ſubject. If his caſt of thought was not original, yet it was free, enlarged, and manly. What he was in the capacity of a teacher of religion, his ſeveral congregations will teſtify with grateful and affectionate rememberance. Few miniſters have paid ſuch unremitting attention to the perfection of their pulpit compoſitions; nor was it only by detached diſcourſes that he inculcated the truths of morality and religion, but by methodical plans of inſtruction, drawn up with great care and comprehenſion. The valuable ſtores of this kind which he left behind him, will not be conſigned to oblivion; but, it is hoped, will inform and improve numbers to whom the voice of the preacher could never have extended. In delivery, his manner was grave and impreſſive, depending rather on the weight of juſt enunciation than on the arts of oratory. Little need be added to this ſketch of the moral qualities of the excellent man above commemorated. If moderation, compliancy, and gentleneſs were ever prevalent in him to a degree of exceſs, who that knew him will blame an exceſs which opened his ſoul to every emotion and office of affection and friendſhip?

This account of Dr Enfield, which is taken from the *Monthly Magazine*, is acknowledged by its author to be the effuſion of friendſhip; but we believe that the panegyric, though high, is in general juſt. It is our duty, however, to warn our readers againſt placing implicit confidence in the Doctor's repreſentation of ancient philoſophy; for though we have frequently found him correct, and have therefore quoted him with approbation ourſelves, we have likewiſe found him ſometimes miſtaking the ſenſe of his authors. In a work like his, miſtakes were indeed unavoidable; for when he reſolved to compreſs the ſubſtance of Brucker's five volumes within the compaſs of two, he could not avoid ſometimes giving what he thought the *ſenſe* of the ancients, when accuracy required their very *words* to be given. This we believe to be the ſource of thoſe errors in his elegant hiſtory, which we have heard others unjuſtly attribute to deſign; for had it been his *deſign* to deceive, he would not ſurely have ſtored his margin with references to enable every reader to detect the deceit.

Enfield, a townſhip in Hartford co. Connecticut, on the E. bank of Connecticut river, oppoſite to Suffield, and bounded on the N. by the Maſſachuſetts line: it was granted by the court of Maſſachuſetts, to Springfield, in 1648, and was ſettled in 1681. In 1769 it contained 214 Engliſh families. In the town are two Congregational churches, and a meeting-houſe for Shakers. The compact part of the town, contiguous to the river, is very pleaſant. It is 16 or 18 miles N. of Hartford.—*Morse.*

Enfield, a townſhip in Grafton co. New-Hampſhire, about 11 miles S. E. of Dartmouth College. It was incorporated in 1761, and has 724 inhabitants, chiefly farmers.—*ib.*

ENGANNO, Trompeur, or *Falſe Cape*, is the eaſternmoſt land of the iſland of St. Domingo, 5½ leagues northerly of Pointe de l'Epee, and 22 S. E. of Cape Raphael, or Round Mountain. N. lat. 19. 3. W. long. from Paris 71. 25.—*ib.*

ENGINEER is the appellation of him whoſe profeſſion it is to contrive or make any kind of uſeful engine or machine. He is denominated either a civil or military engineer, according as the objects of his profeſſion reſpect civil or military purpoſes. See Fortification, *Encycl.* and Machine in this *Supplement.*

ENGLISH *Harbor*, one of the beſt harbors in the iſland of Antigua, on the S. ſhore, a mile S. E. of the mouth of Falmouth harbor. It it well fortified, and has a royal navy yard and arſenal, with conveniences for careening ſhips of war. N. lat. 17. 8. 25. W. long. 61. 27. 30.—*Morse.*

English Neighbourhood, a village in Bergen co. New-Jerſey, on a N. E. branch of Hackinſack river, W. of, and in the vicinity of Fort Lee.—*ib.*

Englishtown, in New-Jerſey, a ſmall village in the N. weſtern part of Monmouth co. on the road from Princetown to Shrewſbury, 21 miles from the former, 6 W. of Monmouth court-houſe, and 18 E. of Princeton.—*ib.*

ENGONASIS, in aſtronomy, the ſame as Hercules, one of the northern conſtellations.

ENGRAFTING. See Grafting, *Encycl.* where it is ſaid that there is little hope of producing mixed fruits by engrafting one tree upon another of the ſame claſs. We confeſs ourſelves to be unwilling to relinquiſh this opinion; but it would be very unfair to withhold from the public any fact which ſeems to militate againſt it, and has come to our knowledge. We ſhall therefore tranſcribe from the *Philoſophical Magazine* the following communication from Dr Thornton, lecturer on medical botany at Guy's Hoſpital, reſpecting a ſuppoſed *Luſus naturæ*, which he conſiders as the conſequence of engrafting.

In the firſt volume of the *Philoſophical Tranſactions*, N° XXIX. publiſhed November 1667, you have the following communication, intitled,

"Some Hortulan Experiments about the engrafting of Oranges and Lemons or Citrons, whereby is produced an individual Fruit, half Orange and half Lemon, growing together as one Body upon the ſame Tree."

We have here orange trees (ſaith the intelligence from Florence) that bear a fruit which is citron on one ſide and orange on the other. They have been brought hither out of other countries, and they are now much propagated by engrafting. This was confirmed to us (ſays the editor of the Tranſactions of the royal Society) by a very ingenious Engliſh gentleman, who aſſerted, that himſelf not only had ſeen, but bought of them, anno 1660, in Paris, whither they had been ſent by Genoa merchants; and that on ſome trees he had found an orange on one branch and a lemon on another branch (which is not ſo remarkable as what follows); as alſo, one of the ſame fruit, half orange and half lemon; and ſometimes three quarters of one, and a quarter of the other.

In the third part of the Reports of the Board of Agriculture, among the foreign communications, we ſee, with equal pleaſure and aſtoniſhment, an account of the American apple, which, by a peculiar mode of budding (A), is half ſweet an half ſour, half white and half red, without the leaſt confuſion of the reſpective halves.

At Mr Maſon's, floriſt, Fleet-ſtreet, oppoſite the Bolt and Tun, there is a production now, September 1798, to be ſeen half peach and half nectarine. It has all the ſoftneſs and yellow down of the peach, and the ſleek red ſmoothneſs of the nectarine; ſuppoſed to be a *luſus naturæ*, but probably is rather the ſportings of art than of nature, and which perhaps will be the cauſe why we ſhall in future ſee many other ſuch vegetable wonders, which, as we ſee, were known to our anceſtors.

ENNEADECATERIS, in chronology, a cycle or period of 19 ſolar years, being the ſame as the golden number and lunar cycle, or cycle of the moon.

ENO, a river in N. Carolina, which unites with Little and Flat rivers in Orange co. and forms the Neus, about 17 miles below Hillſborough.—*Morse.*

ENOREE, a N. W. branch of Broad river in S. Carolina. It ſeparates Pinckney and Ninety-Six diſtricts, and joins Broad river about 5 miles below Tyger river.—*ib.*

ENSETE. See Musa, *Encycl.*

EOLIPILE. See Æolipile, *Encycl.*

EPAULE,

(A) The manner in which the extraordinary nectarine peach firſt produced in this country was effected, was by inſerting the bud of one fruit upon the ſtock bearing a different ſort.

EPAULE, or Espaule, in fortification, the ſhoulder of the baſtion, or the angle made by the face and flank, otherwiſe called the angle of the epaule.

EPHRATA, or *Dunkard Town*, a village in Lancaſter co. Pennſylvania, ſituated on the N. W. ſide of Calico creek, which, joining the Coneſtoga, falls into the Suſquehanna. It lies 12 miles N. of the town of Lancaſter, and upwards of 60 W. of Philadelphia. It is ſituated in a romantic and ſequeſtered vale, and poſſeſſed by a religious community called *Tunkers*, who are moſtly of German deſcent, and believe in general redemption. They uſe great plainneſs of dreſs and language, and will neither ſwear, nor fight, nor go to law, nor take intereſt for the money they lend. They have many peculiarities; but their innocent manners have acquired them the name of the harmleſs Tunkers. This ſettlement is ſometimes called Tunker's Town, and conſiſts of about 40 buildings; of which 3 are places of worſhip. They ſubſiſt by cultivating their lands, by attending a printing-office, a griſt-mill, a paper-mill, an oil-mill, &c. and the ſiſters by ſpinning, weaving, ſewing, &c. Beſides this congregation at Ephrata, there were in 1770, 14 others of this ſect in various parts of Pennſylvania, and ſome in Maryland. The whole, excluſive of thoſe in Maryland, amounted to upwards of 2000 ſouls.—*Morſe*.

EPISCOPACY is a ſubject of which, in our own opinion, enough has been ſaid in the *Encyclopædia*. We are requeſted however to inſert in this place an argument additional to n° 17. of that article; and we comply with the requeſt the more readily that we find the argument, which has been ſuggeſted to us, in that very work of Dr Berkeley's which we were permitted to abridge even before our amiable friend had publiſhed it himſelf. The argument indeed is not new. It was, we believe, *firſt* uſed by Dr Wells in ſome controverſial letters againſt the Engliſh diſſenters, which were publiſhed early in the current century. Dr Berkeley adopted it from Dr Wells; and other doctors have taken it from Dr Berkeley. It is as follows:

That the apoſtles eſtabliſhed *two* orders of miniſters in the Chriſtian church is admitted by all who contend not for the equal and common rights of Chriſtians; and that the perſons occupying the higher order, by whatever title they were known, or however limited may have been the juriſdiction of each, poſſeſſed authority as well to ordain others as to preach the goſpel and adminiſter the ſacraments, is the very point on which the advocates for the divine right of preſbytery inſiſt. At the reformation, however, and for 1400 years before, there was an intermediate order of miniſters between theſe two, known by the name of prieſts or preſbyters, *authoriſed* indeed to preach the goſpel and to adminiſter its ſacraments, but *not* authoriſed to ſend labourers of any kind into Chriſt's vineyard. This *intermediate* order therefore being, by the ſuppoſition, diſtinct from the two *apoſtolical* orders of miniſters, muſt have been, at whatever period it was introduced into the church, an order of *human* invention; but it is from this order of miniſters that the clergy of thoſe churches, which are not Epiſcopal, derive all their authority to miniſter in holy things. The conſequence is obvious.

Scotch Episcopalians are a ſociety of Chriſtians certainly as reſpectable, if not ſo numerous, as any other in the kingdom which diſſents from the worſhip and diſcipline of the eſtabliſhed church. For many years, however, the public worſhip of that ſociety was proſcribed by the legiſlature; and there is reaſon to ſuſpect that its real principles are not yet univerſally underſtood. If this be ſo, it ſurely becomes the editors of a work in which ſome account is given of almoſt every denomination of Chriſtians down to the novel ſect which ſtiles its members Bereans, to do juſtice to the venerable remains of what was once the eſtabliſhed church of their native country.

1
Eſtabliſhment of Epiſcopacy in Scotland.

That the reformation from popery was in Scotland tumultuous and irregular, is known to all Europe: and very few of our readers can be ignorant that there was neither order in the reformed church, nor decency in her worſhip till James VI. with much addreſs, accompliſhed the eſtabliſhment of a very moderate epiſcopacy. To this form of church government the better part of the nation was ſufficiently attached; and it continued to be the eccleſiaſtical polity, ſupported by the ſtate, till the grand rebellion, when it was overthrown by the partizans of the *national covenant*. It was reſtored, however in 1662; and again aboliſhed in 1689 by that convention which placed the Prince and Princeſs of Orange on the ancient throne of the Scottiſh monarchs.

2
No liturgy uſed in the Scotch church,

Theſe events are ſo univerſally known, that it is ſufficient in this place barely to mention them; but there are probably many of our readers who do not know, that, during the whole period of her legal eſtabliſhment, the Scotch epiſcopal church had no public liturgy. It appears indeed, that the firſt reformers made uſe of the Engliſh book of common prayer; and there is on record ſufficient evidence that John Knox himſelf, though he diſapproved of ſome things in that book, had no objection either to ſtated forms of prayer in general, or to a ſubordination among the miniſters of the goſpel; but his ſucceſſor Andrew Melvil, who poſſeſſed neither his learning nor his worth, had influence enough to introduce into the church a perfect parity of miniſters, and to excite among the people a very general abhorrence of liturgical worſhip. So rooted indeed was that abhorrence, that, as every one knows, an attempt to introduce into the church of Scotland a book of common prayer, copied with ſome alterations from that of England, produced the *ſolemn league and covenant*, which involved in one common ruin the unfortunate Charles and his darling Epiſcopacy. At the reſtoration of the monarchy, the Epiſcopal conſtitution of the church was reſtored, but no new attempt was made to eſtabliſh the uſe of a public liturgy, and except at the ordinations of the clergy, when the Engliſh forms were uſed, no ſervice book was ſeen in a Scottiſh church.

3
Except at ordinations.

For ſome years after Epiſcopacy had ceaſed to be the religion of the ſtate, the deprived clergy made no alteration in their modes of ſocial worſhip. Having refuſed to transfer to King William that allegiance which they had ſworn to King James, they were treated, during his reign with ſuch ſeverity, that on the Lord's day they durſt not venture further than to officiate "in their own hired houſes, where they received ſuch friends as choſe to come in unto them;" and in thoſe ſmall congregations, if congregations they may be called, they continued to pray, if not extempore, at leaſt without book, till the acceſſion of Anne to the throne of her anceſtors. The attachment of that Princeſs, not only to the conſtitution, but alſo to the worſhip of the church of England, was well known to them ; and they very reaſonably thought that they could not more effectually recommend themſelves to her protection than by adopting the uſe of the Engliſh liturgy, which the moſt enlightened among them had long profeſſed to admire. It was accordingly introduced by degrees into Scotland; and an act of parliament being paſſed on the 3d of March 1712, "to prevent the diſturbing of thoſe of the Epiſcopal communion in that part of Great Britain called Scotland, in the exerciſe of their religious worſhip, and in the uſe of the liturgy of the church of England," that liturgy was univerſally adopted by the Scotch Epiſcopalians ; and public chapels, which had hitherto been prohibited, were everywhere built, and well frequented.

4
Introduction of the Engliſh liturgy.

That thoſe who had refuſed allegiance to King William and Queen Anne ſhould ſcruple to pay it to a new family, clogged as it was by ſo many oaths, can excite no wonder ; nor, is it at all wonderful, that, for their attachment to the abdicated family, the public worſhip of the Scotch Epiſcopalians was, after the inſurrection of 1715 and 1716, laid under ſome reſtraints. Theſe, however, were neither rigorouſly ſevere, nor of long duration ; and by the year 1720, their congregations were as numerous as formerly, conſiſting, eſpecially in the northern counties, of men of all ranks, even ſuch as held offices of truſt under the eſtabliſhed government, who frequented the Epiſcopal chapels in preference to the pariſh churches.

Hitherto the Epiſcopalians had been ſafely conducted through all dangers and difficulties by the prudence of Dr Roſe, the deprived biſhop of Edinburgh ; but ſoon after his death, which happened on the 20th of March, 1720, diviſions broke out among them, which threatened to prove more fatal to their church than any perſecution to which they had yet been ſubjected. For reaſons which will be ſeen afterwards, it is proper to trace thoſe diviſions from their ſource.

5
Sources of diviſion among the Scotch Epiſcopalians.

No native of Britain, who knows any thing of the hiſtory of his country, can be ignorant, that Dr Sancroft, the archbiſhop of Canterbury, and five other biſhops, were at the Revolution deprived of their ſees by an act of parliament ; becauſe, like the Scotch biſhops, they could not bring themſelves to transfer to King William and Queen Mary that allegiance which they had ſo lately ſworn to King James. As thoſe prelates were extremely popular for the vigorous oppoſition which they had given to ſome of the Popiſh projects of the late king, and as a number of inferior clergymen, of great eminence for piety and learning, were involved in the ſame fate with them ; it need not excite great ſurpriſe, that a ſweeping deprivation, which, in all its circumſtances, was perhaps without a precedent in eccleſiaſtical hiſtory, produced a ſchiſm in the church of England. The deprived clergy, conſidering the biſhops who were placed in the ſees thus vacated as intruders, and all who adhered to them as ſchiſmatics, opened ſeparate chapels under the authority of the primate and his nonjuring ſuffragans ; and contended, that they and their adherents conſtituted the only orthodox and catholic branch of the church in England.

Both churches, however, made uſe of the ſame liturgy : and during the lives of the deprived prelates, there was no other apparent difference in their worſhip than what neceſſarily reſulted from their paying allegiance to different ſovereigns. But this uniformity was not of long duration. The biſhops, who had been poſſeſſed of ſees before the Revolution, were ſcarcely dead, when their ſucceſſors, being under no civil reſtraint, found, in the principles which they had brought with them from the eſtabliſhment, the means, not only of dividing their own little church, but likewiſe of ſowing the ſeeds of diſſenſion among their brethren in Scotland.

It has been obſerved elſewhere*, that in the church of England there are three opinions reſpecting the nature and end of the Lord's Supper, which, in oppoſition to each other, have been all patroniſed by men of great eminence for theological learning. It appears, indeed, from the firſt liturgy ſet forth by authority in the reign of King Edward VI. that the reformers of that church, from the errors of popery unanimouſly held the Lord's Supper to be a euchariſtical ſacrifice ; and this opinion, which has been adopted by great numbers in every age ſince, ſeems to have been the moſt prevalent of the three among thoſe clergy who were deprived of their livings at the Revolution. It is indeed countenanced by ſeveral paſſages in the preſent order for the adminiſtration of the Lord's Supper ; and therefore, though there are other things in that order which cannot be eaſily reconciled to it, archbiſhop Sancroft, and his ſuffragans, whatever their own opinions might be, choſe not to widen the breach between themſelves and the eſtabliſhment, by deviating in the ſmalleſt degree from the form in which they had been accuſtomed to celebrate that ſacrament. Their ſucceſſors, however, in office, were men of different diſpoſitions. Conſidering themſelves as totally unconnected with the ſtate, and no longer bound by the act of uniformity, one party, at the head of which was biſhop Collier, the celebrated eccleſiaſtical hiſtorian (A), judged it proper to make ſuch alterations in the communion office as might render it more ſuitable to their own notions of the Lord's Supper, and bring it nearer, both in matter and form, to the moſt ancient liturgies of the Chriſtian church.

* Supper of the Lord, *Encycl.*

Of the propoſed alterations, ſome were perhaps proper in their circumſtances ; whilſt others, to ſay the beſt of them, were certainly needleſs, if not inexpedient. They were accordingly *all* oppoſed by another powerful party of nonjurors ; and the queſtions in diſpute were referred, firſt to Dr Roſe, the deprived biſhop of Edinburgh, and afterwards to Dr Atterbury and Dr Potter, the biſhops of Rocheſter and Oxford. What judgment the two Engliſh prelates gave in this controverſy we know not ; but that of biſhop Roſe did him much honour. Declining the office of umpire between the parties, he recommended mutual forbearance and occaſional communion with each other, according to either form ; and employed a gentleman, well verſed in eccleſiaſtical literature, to prove that ſuch a compliance of biſhops with each other's innocent prejudices was not uncommon in the pureſt times.

Theſe

(A) This very learned, though violent man, of whom the reader will find ſome account in the *Encyclopædia*, was, with Dr Hickes and others, conſecrated by the deprived prelates, for the purpoſe of preſerving the Epiſcopal ſucceſſion in what they conſidered as the true church of England.

Theſe diſputes among the Engliſh nonjurors, and the appeal which was made to Dr Roſe, drew, more cloſely than hitherto it had been drawn, the attention of the Scotch Epiſcopal clergy, not only to their own liturgy, which had been authoriſed by King Charles I. but likewiſe to the moſt ancient liturgies extant, as well as to what the fathers of the firſt three centuries have taught concerning the nature of the Lord's Supper. The conſequence was, that ſuch of them as were ſcholars ſoon diſcovered, that the Scotch communion office approached much nearer to the moſt ancient offices than the Engliſh; and a powerful party was formed for reviving the uſe of it in Scotland.

6
Revival of ancient uſages.

Had thoſe men aimed at nothing farther, it is probable they would have met with very little oppoſition. Their opponents, who, in general, were leſs learned than they, were ſo ſtrongly attached to the houſe of Stuart, that they would have adopted almoſt any thing ſanctioned by the royal martyr's authority; but the advocates for the Scotch office knew not where to ſtop. They wiſhed to introduce ſome other uſages of the primitive church, ſuch as the commemoration of the faithful departed, and the mixture of the euchariſtic cup (See *Supper of the Lord*, n° 2. and 3. *Encycl.*); and their brethren, perceiving no authority from Charles I. for theſe things, and being accuſtomed to conſider them as Popiſh practiſes, a violent controverſy was ready to burſt forth about what every enlightened mind muſt conſider as matters of very little importance.

That the euchariſtic cup was in the primitive church mixed with a little water, is a fact incontrovertible; that the practice was harmleſs and decent, it is wonderful that any man ſhould deny; but that ſuch a mixture is *eſſential* to the ſacrament, we cannot believe, for the reaſons aſſigned in the article referred to; and therefore it ought ſurely to have been no object of contention.

That the faithful departed were commemorated in the primitive church long before the invention of purgatory, is known to every ſcholar; that in thoſe days ſuch a commemoration tended to invigorate the faith and the charity of Chriſtians, it would, in our opinion, be very eaſy to prove; and that at preſent every Chriſtian prays in private for his deceaſed friends, we have proved elſewhere by arguments, of the confutation of which we are under no apprehenſion (See *Greek-church* in this *Supplement*): but we ſee not the *neceſſity* of introducing ſuch prayers into public worſhip at any period; and we perceive impropriety in doing it at a period when, from various circumſtances, they may cauſe weak brethren to err. But thoſe who pleaded for the revival of this practice in the beginning of the current century, were blinded by their very erudition (B); and thoſe who oppoſed it ſeem not to have been acquainted with the workings of a benevolent and devout mind, or indeed to have known in what the eſſence of a prayer conſiſts.

The ancient uſages, however, were not the only ſubjects which, on the death of biſhop Roſe, furniſhed matter for controverſy among the Scotch Epiſcopalians. That excellent prelate, together with the deprived archbiſhop of Glaſgow, and the deprived biſhop of Dunblain, had, from time to time, as they ſaw occaſion, raiſed to the Epiſcopal dignity ſome of the moſt deſerving Preſbyters of the church; but it was reſolved, for what reaſon we do not very well know, that none of the new biſhops ſhould be appointed to vacant dioceſes during the life of any one prelate who had poſſeſſed a legal eſtabliſhment; ſo that biſhop Roſe, who ſurvived all his brethren, was for ſeveral years the eccleſiaſtical governor of the whole Epiſcopal church in Scotland. On his death, therefore, though there were four biſhops in Scotland, and two Scotch biſhops reſiding in London, there was not one of thoſe prelates who could claim to himſelf the authority of a dioceſan over any portion of the Catholick church. This they at firſt unanimouſly

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(B) Paradoxical as this aſſertion may at firſt ſight appear, nothing is more certain than that erudition, and even ſcience, if *partially* cultivated, is as likely to blind as to enlighten the underſtanding. When a man devotes all his time, and all his attention, to *one* purſuit, he contracts ſuch a fondneſs for it, as gradually to conſider it as the *only* valuable purſuit, which will infallibly lead to truth, and to nothing but truth; and in this diſpoſition of mind, he is ready to embrace the moſt extravagant abſurdity to which it may conduct him. Of this the reader will find one very ſtriking inſtance in page 628 vol. I. of this Suppl. where the celebrated Euler appears ſo devoted to his darling analyſis, as to place implicit confidence in it, even when he himſelf ſeems ſenſible that it had led him to a concluſion contrary to common ſenſe, and the nature of things. That Dr Bentley was a very eminent philologiſt, is univerſally known; that his emendatory criticiſms on the Claſſics are often happy, no man will deny; and yet, miſled by his favourite purſuits, he never pronounces more dogmatically than when the dogma which he utters is untenable. We appeal to his criticiſms on Milton. Perhaps there is not a man alive who will refuſe to Dr Waburton the praiſe of learning and ingenuity. The addreſs with which he detects the double doctrines of the ancient philoſophers, is ſometimes almoſt aſtoniſhing; yet, miſled by his own ardour in this purſuit, he diſcovers hidden meanings everywhere, and has found a rational ſyſtem of religion in ſome of the ancient myſteries, where there is every reaſon to believe that nothing in reality was to be found but atheiſm and vice. Juſt ſo it is with the ardent reader of the Chriſtian fathers. If he devote all his time to the ſtudy of their writings, he not only becomes enamoured of his employment, but acquires gradually ſuch a veneration for the character of his maſters (and venerable they undoubtedly are) as renders him afraid to queſtion any thing which they advance, and unable to diſtinguiſh between their teſtimony, which is deſerving of all credit, and their reaſonings, which are often inconcluſive. We truſt it is needleſs to diſclaim any wiſh to diſcourage, by this note, the ſtudy either of the Chriſtian fathers, the Greek philoſophers, philological criticiſm, or the modern analyſis; we only wiſh to diſſuade men of letters from devoting their whole time to any *one* purſuit whatever; for they may depend upon it, that ſuch *partial* ſtudies contract the mind. One of the moſt eminent mathematicians at preſent in England is reported to have declared his contempt of *the Paradiſe Loſt*, becauſe he found in it nothing *demonſtrated!*

nimouſly acknowledged; and one of them, in the name of himſelf and his brethren, recommended to the clergy of the dioceſe of Edinburgh to elect, after the primitive plan, a ſucceſſor to their late venerable dioceſan. The advice was followed; the election was made, and approved by the biſhops: and Dr Fullarton, the biſhop choſen, became biſhop of Edinburgh, by the ſame means and the ſame authority as, in the primitive church, St Cyprian became biſhop of Carthage, or Cornelius biſhop of Rome.

7 College of biſhops.

The clergy in other diſtricts, following the example of thoſe in Edinburgh, dioceſan Epiſcopacy was about to be revived throughout all Scotland upon principles purely eccleſiaſtical, when ſome of the biſhops, whom Dr Roſe had left behind him merely for preſerving the Epiſcopal ſucceſſion, conceived a new and very extraordinary conſtitution for the Scotch Epiſcopal church. Whether they were envious of their colleagues, and offended that none of the elections had fallen upon them; whether they were ſo ignorant as not to know that dioceſan Epiſcopacy had ſubſiſted long before the converſion of the Roman empire, in abſolute independence on the ſtate; or that they were actuated, as there is reaſon to ſuſpect, by ſome political principle which they could not with ſafety avow;—ſo it was, that they oppoſed dioceſan Epiſcopacy of every kind, and propoſed to govern the whole Scotch church by a college of biſhops. Againſt this unprecedented ſcheme the more learned biſhops oppoſed all their influence; and being exceedingly diſagreeable to the inferior clergy, it was very ſoon abandoned by its authors themſelves, who, after ſome acrimonious controverſy, were glad to come to an agreement with their dioceſan brethren.

8 Thoſe diviſions healed.

Of this agreement, or *concordate* as it was called, the following were the principal articles: 1. "That the Scotch or Engliſh liturgy, and no other, might be indifferently uſed in the public ſervice; and that the peace of the church ſhould not be diſturbed by the introduction of any of the ancient uſages which had lately excited ſuch diſſenſions. 2. That no man ſhould thenceforward be conſecrated a biſhop of the Scotch church without the conſent and approbation of the majority of the biſhops. 3. That the biſhops, by a majority of voices, ſhould chooſe one of their number to preſide in the meetings of his brethren, and to convocate ſuch meetings when he judged them neceſſary: that this preſident ſhould be ſtyled *Primus Epiſcopus*, or more ſhortly *Primus*; but that he ſhould not poſſeſs metropolitical power, or claim any kind of juriſdiction without the bounds of his own dioceſe or diſtrict. 4. That upon the vacancy of any dioceſe or diſtrict, the preſbyters ſhould neither elect, nor ſubmit to, another biſhop, without receiving a mandate by the Primus, iſſued with the conſent of the majority of his colleagues."

This concordate was in 1731-2 ſubſcribed by all the biſhops then in Scotland, who immediately became dioceſans, and thought no more of the college ſyſtem. It was afterwards, with a few additions, for aſcertaining more preciſely the prerogatives of the Primus; for regulating the conduct of ſynods; for exempting biſhops from the juriſdiction of other biſhops, in whoſe diſtricts they might chance to reſide; and for preventing inferior clergymen from deſerting their congregations, or removing from one diſtrict to another, without the conſent of the biſhops of both—thrown into the form of canons; and theſe canons have continued to be the code of the Scotch Epiſcopal church down to the preſent day.

9 Political opinions.

The members, and more eſpecially the clergymen of this church, had always been conſidered as unduly attached to the family of Stuart; and though there was undoubtedly at firſt ſome ground for that ſuſpicion, the writer of this article knows, from the moſt incontrovertible evidence, that it was continued too long, and carried by much too far. Jacobitiſm was imputed to the ſociety as its diſtinguiſhing tenet; but the members of that ſociety have at all times contended, that their diſtinguiſhing tenets were the apoſtolical inſtitution of Epiſcopacy, and in the exerciſe of thoſe powers which are purely ſpiritual, the independency of the church upon the ſtate. In politics, indeed, they have unanimouſly maintained, that the only ruler of princes or *legiſlatures* is God, and not the people. They are, of courſe, no friends to the faſhionable doctrine of reſiſtance, which they believe to be not only condemned in expreſs terms by Chriſt and two of his apoſtles, but to be alſo the ſource of that anarchical tyranny which is at preſent deluging Europe with blood. They conſider a limited monarchy, like that of Britain, as the moſt perfect form of civil government which the world has ever ſeen; an hereditary monarchy is infinitely preferable to one that is elective; and with reſpect to the title of the monarch, when they take a retroſpective view of the origin of all civil governments, they cannot but look upon a permanent and unqueſtioned eſtabliſhment as an indication of the plan and determination of Providence furniſhing the beſt right to a crown which any modern ſovereign can claim.

10 Perſecution.

Surely theſe are harmleſs opinions; and yet the worſhip of thoſe who held them was, in 1746 and 1748, laid under ſuch reſtraints as were calculated to produce diſaffection where it did not previouſly exiſt. Two laws were then enacted againſt the Scotch Epiſcopalians; which, under the pretence of eradicating their attachment to the houſe of Stuart, were ſo contrived as to preclude ſuch of their clergy as were willing to pay allegiance to the reigning ſovereign, and to pray for the royal family by name, from reaping the ſmalleſt benefit from their loyalty. The experiment was tried by ſome of them; of whom one venerable perſon, who was never ſuſpected of undue attachment to the houſe of Stuart, is ſtill alive; but he, and his complying brethren, had their chapels burnt, and were themſelves impriſoned, as if they had been the moſt incorrigible Jacobites. This was a kind of perſecution which, ſince the Reformation, has had no precedent in the annals of Britain. A prieſt of the church of Rome, by renouncing the errors of Popery, has at all times been qualified to hold a living in England; a diſſenting miniſter, of whatever denomination, might at any time be admitted into orders, and riſe to the higheſt dignities of the Engliſh church;—but while the laws of 1746 and 1748 remained in force, there was nothing in the power of a Scotch Epiſcopal clergyman to do from which he could reap the ſmalleſt benefit. By taking the oaths to government, he was not qualified to hold a living in England, or even to enjoy a toleration in Scotland; and his clerical character being acknowledged by the Engliſh biſhops, he could not by thoſe prelates be canonically reordained.

11 Toleration. Upon the clergy, however, thoſe laws of uncommon rigour were not long rigorouſly executed. After a few years, the burning of chapels, and the impriſoning of miniſters, were occurrences far from frequent; but the laws to which we allude affected likewiſe the political privileges of ſuch laymen as frequented the Epiſcopal chapels; and in that part of their operation, thoſe laws were never relaxed till 1792, when they were wholly repealed, and the Epiſcopalians in Scotland tolerated like other well affected diſſenters from the national eſtabliſhment.

12 Faith of the Scotch Epiſcopal church. While Epiſcopacy was the eſtabliſhed form of church government in Scotland, the clergy of that church ſubſcribed a confeſſion of faith ſummed up in twenty-five articles, which the reader will find in the hiſtory attributed to John Knox. It is ſufficient to obſerve in this place, that in eſſentials it differs little from the articles of moſt other reformed churches; and in every thing which does not immediately relate to *papiſtry*, it is moderate and unexceptionable; perhaps more ſo than the preſent confeſſion of either of the Britiſh churches. During the period which intervened between the Revolution and the year 1792, no ſubſcription was indeed required from Scotch Epiſcopalian clergymen to any ſummary of Chriſtian doctrine; but at their ordinations, thoſe clergy ſolemnly profeſſed their belief of all the canonical books of the Old and New Teſtaments; declared their perſuaſion that thoſe books contain ſufficiently all doctrines neceſſary to ſalvation, through faith in Jeſus Chriſt; and were obliged to read daily in their chapels the Engliſh book of Common Prayer, which contains the Apoſtles, Nicene, and Athanaſian creeds. But now thoſe clergymen are enjoined by act of parliament to ſubſcribe the 39 articles of the church of England; ſo that the principles of their faith are well known. No doubt there are differences of opinion among them about the ſenſe of ſome of thoſe articles; and it is well known that there are ſimilar differences among the Engliſh clergy themſelves: but there is every reaſon to believe, that the faith of the Scotch Epiſcopalians has, in every important point, been at all times orthodox.

13 Their worſhip. We are aware, that they have been repreſented as unfriendly to the Engliſh ſervice; but ſuch a repreſention appears to be either a wilful falſehood, or the offspring of ignorance. The only reformed liturgy that ever had the ſanction of a civil eſtabliſhment in Scotland, is *the Book of Common Prayer, and Adminiſtration of the Sacraments, and other parts of Divine Service* authoriſed by King Charles I. In that book, the order of adminiſtration of the Lord's Supper differs in ſome particulars from the Engliſh order, and is unqueſtionably better adapted to the opinions of thoſe who conſider that holy ordinance either as an euchariſtical ſacrifice, or as a feaſt upon a ſacrifice. In the one or other of theſe lights, the Lord's Supper is viewed by a great majority of the Scotch Epiſcopalians; and of courſe the Scotch communion office is uſed in a great majority of their chapels: but it is not uſed in them all. Their biſhops, who, when in England, communicate with the eſtabliſhed church, leave the inferior clergy at liberty to uſe either the Engliſh or the Scotch form, as is moſt agreeable to themſelves and to the people among whom they miniſter; and to ſilence the clamour of ſymbolizing with the church of Rome, which was ſome years ago either ignorantly or maliciouſly raiſed againſt them, they altered the *arrangement* of the Scotch prayer of conſecration, ſo as not only to bring it nearer to the moſt primitive forms, but alſo to make it abſolutely inconſiſtent with the real preſence, as taught either by the church of Rome or by the Lutheran churches. On this ſubject, see GREEK-CHURCH, n° 17. in this *Supplement*.

14 Engliſh clergymen in Scotland. Thus have we given a ſhort view of the diſtinguiſhing principles of what muſt ſurely be conſidered as a very reſpectable ſociety of Chriſtians, and the only reformed *Epiſcopal* ſociety in that part of Great Britain called Scotland. There are, indeed, chapels in Scotland diſtinct from the church of which we have been treating, where the Engliſh liturgy is read by clergymen who have received Epiſcopal ordination either in England or in Ireland; but thoſe chapels being all independent of each other, and under the inſpection of no biſhop, the perſons who frequent them ſeem to be rather Congregationaliſts than Epiſcopalians, and certainly do not conſtitute what can, with any propriety, be called an *Epiſcopal church*.

EPPING, a plantation in the diſtrict of Maine, of about 25 families, 12 miles from Narraguague.—*Morse*.

EPPING, a townſhip in Rockingham co. New-Hampſhire, taken from the N. W. part of Exeter, and incorporated in 1741. In 1790 it contained 1233, now 1740 inhabitants. It is 6 miles N. W. of Exeter, and 23 W. of Portſmouth.—*ib*.

EPSOM, a townſhip in Rockingham co. New-Hampſhire, lies E. of Pembroke, adjoining; 10 miles E. of Concord, and 45 miles N. W. of Portſmouth. It was incorporated in 1727; in 1775 it contained 387, and in 1790, 799 inhabitants.—*ib*.

EQUANT, in aſtronomy, a fanciful circle, introduced into ſcience to remove ſome of the defects of the Ptolemaic ſyſtem of the univerſe. In this artificial ſyſtem of epicycles and eccentric circles, the idea of circular and equable motion was by no means abandoned; but while each of the heavenly bodies revolved in its own orb, the centre of that orb was ſuppoſed to be carried at the ſame time round the circumference of another circle. The more obvious inequalities were thus explained with a geometrical preciſion. With all its nice combination, however, of circles, the ſyſtem was ſoon found to have defects; to remove which, the fine contrivance of the equant was introduced. Though the angular motion of a planet viewed from the earth was confeſſed to be unequal, a point could be conceived from which it would be ſeen to move with perfect uniformity. That point was made the centre of the equant, and lay at the ſame diſtance from the centre of the eccentricity on the one ſide, as the earth was removed on the other. "Nothing (ſays Dr Smith, from whom this account of the equant is taken) can more evidently ſhew, how much the repoſe and tranquillity of the imagination is the ultimate end of philoſophy, than the invention of this equalizing circle."

EQUATION OF A CURVE. See ALGEBRA *(Encycl.)* Part III. chap. ii.

Secular EQUATION, in aſtronomy. See ASTRONOMY in this *Supplement*, n° 25—38.

EQUICURVE CIRCLE, the ſame with *CIRCLE of Curvature*, which ſee in this Supplement.

Ergett de krane || Erkoom.

ERGETT EL KRANE } ERGETT Y'DIMMO } Two Abyſſinian ſhrubs of the genus MIMOSA, which ſee, *Encycl.*

ERIE, FORT, a ſtrong fortification in Upper Canada, ſituated on the N. ſhore of lake Erie, and on the W. bank of Niagara river, 27 miles S. by E. of Niagara Fort, and 18 above the carrying place at the Falls of Niagara. N. lat. 42. 59. W. long. 78. 20. 30. —*Morſe.*

ERIE, a lake of the fourth magnitude in North-America, and through which runs the line between the United States and Upper Canada. D'Etroit river on the W. brings the waters of the great lakes with which lake Erie has a communication on the N. W. and Niagara river on the E. forms its communication with the waters of lake Ontario and the river St. Lawrence. It is ſituated between 41. and 43. N. lat. and between 78. 48. and 83. W. long. Its form is eliptical. Its length is about 225 miles; and its medium breadth about 40. It affords good navigation for ſhipping of any burden. The coaſt on both ſides of the lake is generally favourable for the paſſage of batteaux and canoes. Its banks in many places have a flat ſandy ſhore, particularly to the eaſtward of the peninſula called Long Point, which runs upwards of 18 miles into the lake, and being compoſed of ſand is very convenient to haul boats out of the ſurf upon it, when the lake is too rough for ſailing and rowing; yet in ſome places, chiefly on the S. ſide towards both ends of the lake, it would be dangerous to approach and impoſſible to land, by reaſon of the perpendicular height of the rocks. Some of theſe, (as at Cayahoga, which are already deſcribed) are magnificent beyond deſcription, and muſt alſo inſpire dread in the boldeſt breaſt, when viewed from the water. Lake Erie has a great variety of fine fiſh, ſuch as ſturgeon, eel, white fiſh, trout, perch, &c. Lakes Huron and Michigan afford communication with lake Erie, by veſſels of 8 feet draught. There are portages into the waters of lake Erie from the Wabaſh, Great Miami, Muſkingum, and Alleghany, from 2 to 16 miles. The portage between the Ohio and Potowmac will be about 20 miles, when the obſtructions in the Monongahela and Cheat rivers are removed.—*ib.*

ERIE'S, an Indian nation, called by the French, du Chat, or Cat-nation. They were extirpated by the Iroquois about the year 1655. Were it not for the lake which ſtill bears the name of that nation, one would not have known that they ever exiſted.—*ib.*

ERKOOM, an Abyſſinian bird, part of a large tribe, " in which (ſays Mr Bruce) the greateſt variety lies in his beak and horn. The horn he wears ſometimes upon the beak and ſometimes upon the forehead above the root of the beak." This bird is by naturaliſts called the *Indian crow* or *raven;* and our author, though he ſeems to think this claſſification improper, admits that he has one characteriſtic of the raven; he walks, and does not hop or jump in the manner that many others of that kind do; but then he at times runs with very great velocity, and, in running, very much reſembles the turkey or buſtard when his head is turned from you.

The colour of the eye of this bird is of a dark brown, or rather reddiſh, caſt, but darker ſtill as it approaches the pupil; he has very large eyelaſhes, both upper and lower, but eſpecially his upper. From the point of the beak to the extremity of the tail is three feet ten inches; the breadth, from one point of the wing to the other extended, is ſix feet, and the length twenty-two inches; the length of the neck ten inches, and its thickneſs three inches and a half; the length of the beak, meaſuring the opening near the head ſtraight to the point, ten inches; and from the point of the beak to the root of the horn, ſeven inches and three eighths. The whole length of the horn is three inches and a half. The length of the horn, from the foot to the extremity where it joins the beak, is four inches. The thickneſs of the beak in front of the opening is one inch and ſeven eighths. The thickneſs of the horn in front is one inch and five eighths. The horn in height, taken from the upper part of the point to the beak, two inches. The length of the thighs ſeven inches, and that of the legs ſix inches and five eighths. The thickneſs in profile ſeven lines, and in front four lines and a half. It has three toes before and one behind, but they are not very ſtrong, nor ſeemingly made to tear up carcaſes. The length of the foot to the hinder toe is one inch ſix lines, the innermoſt is one inch ſeven lines, the middle two inches two lines, and the laſt outer one two inches one line. This bird is all of a black, or rather black mixed with ſoot-colour; the large feathers of the wing are ten in number, milk-white both without and within. The tip of his wings reaches very nearly to his tail; his beak and head meaſured together are eleven inches and a half, and his head three inches and a quarter. At his neck he has thoſe protuberances like the Turkey-cock, which are light-blue, but turn red upon his being chafed, or in the time the hen is laying.

Erkoom || Eſcambia.

The erkoom, though not eaſily raiſed, flies (ſays our author) both ſtrong and far. It has a rank ſmell, and is ſaid in Abyſſinia to feed upon dead carcaſes. This, however, he thinks a miſtake, as he never ſaw it following the army, nor approaching a dead carcaſe; and as often as he had occaſion to open this bird, he found in its ſtomach nothing but the green ſcarabeus or beetle. It builds in large thick trees, always, if it can, near churches; has a covered neſt like that of a magpie, but four times as large as the eagle's. It places its neſt firm upon the trunk, without endeavouring to make it high from the ground: the entry is always on the eaſt ſide.

ERROL, a ſmall town on lake Umbagog, in the N. eaſternmoſt ſettled part of Grafton co. New-Hampſhire, incorporated in 1774.—*Morſe.*

ERVINE, a townſhip in Ontario co. New-York. Of its inhabitante 93 are qualified to be electors.—*ib.*

ESCAMBIA, one of the moſt conſiderable rivers that fall into the bay of Penſacola in Weſt-Florida, empties itſelf near the head of the N. branch, about 12 or 15 miles from Penſacola, through ſeveral marſhes and channels, which have a number of iſlands between them, that are overflowed when the water is high. A ſhoal near its mouth prevents veſſels, drawing more than 5 or 6 feet, from entering; but there is from 2 to 4 fathoms of water afterwards. Capt. Hutchins aſcended it in a boat upwards of 80 miles, and from the depth of water there, it appeared to be navigable for pettiaugers many miles further. It is uncertain where its ſource is. The courſe is very winding. At the mouth of the river on the W. ſide was the town of Cambleton, ſettled by French Proteſtants in 1766, but was afterwards abandoned.

The lands in general on each ſide of the river, are rich, low or ſwampy, admirably adapted for the culture of rice or corn. The great number of rivulets which fall into this river from the high circumjacent country, may be led over any part of the rice lands, at any ſeaſon of the year. The numerous iſlands at the mouth of the river, ſome of very conſiderable extent, are not inferior for rice to any in America. The ſettlements made by Meſſrs. Tait and Mitchell, capt. Johnſon, Mr. M'Kinnon, and ſome others, are very evident proofs of this aſſertion; who within two years of their firſt ſettlement, had nearly cleared all the expenſes they had been at in making very conſiderable eſtabliſhments; and would entirely have done it in another year, had not the Spaniards taken poſſeſſion of the country.—*ib.*

ESPIRITU SANCTO, a bay on the W. coaſt of Eaſt Florida, in 27. 8. N. lat. It has a good harbor, 4 fathom water, and ſafe anchorage; but the land all about the coaſt is very low, and cannot be ſeen from a ſhip's deck when in 7 fathom water. Several low, ſandy iſlands and marſhes, covered with mangrove buſhes, lie before the main land. Here are immenſe numbers of fiſh in the ſummer time, which may be caught with a ſein, enough to load a ſhip, (if the climate would admit of curing them) even in a few days. —*ib.*

ESQUIMAUX, a large bay on the Labrador coaſt, into which a river of the ſame name empties. It lies in the N. W. part of the gulf of St Lawrence, near the mouth of the ſtraits of Belleiſle. Eſquimaux iſlands lie acroſs its mouth.—*ib.*

ESSEX *Co.* in Maſſacuſetts, is bounded N. by the ſtate of N. Hampſhire; E. and S. by the ocean, and the town of Chelſea in Suffolk co.; W. by Middleſex co.; in length about 38 miles, in breadth 25; and is ſhaped triangularly, Chelſea being the acute point. The chief iſlands on its coaſt, belonging to it, are Cape Anne and Plumb iſlands. It is ſubdivided into 22 townſhips, which contain 7644 houſes and 57,913 inhabitants; being the moſt populous, of its ſize, of any in the ſtate, having about 135 ſouls to a ſquare mile. The firſt ſettlement in Maſſachuſetts Proper was made in Salem, the capital of the county, in 1628, by John Endicott, Eſq. one of the original patentees, and many years governor of the colony. It was made a ſhire in 1643, being one of the three into which the colony was firſt divided. Eſſex co. pays about one ſeventh part of the ſtate tax, elects ſix ſenators and counſellors for the government of the commonwealth, and one repreſentative in the legiſlature of the United States.—*ib.*

The face of the county is pleaſingly variegated with hills, vales, woods, and plains. The land is generally fruitful; but is more favourable to barley than moſt other parts of the ſtate. Quarries of marble and limeſtone are found in this county; and the ſea coaſt is indented with a number of good harbors. Merrimack river, interſects the N. part of Eſſex county; between it and the New-Hampſhire line are the towns of Methuen, Haverhill, Almſbury and Saliſbury. —*ib.*

Essex *Co.* in Virginia, is bounded E. and N. E by Rappahannock river, which divides it from Richmond. It is about 55 miles long and 12 broad, and contains 9122 inhabitants, of whom 5440 are ſlaves.—*ib.*

Essex *Co.* in New-Jerſey, is in the eaſtern part of the ſtate, and divided from Staten-Iſland by Newark bay. It is about 25 miles in length and 16 in breadth, and has three townſhips, viz. Newark, Elizabethtown and Acquackanack, which contain 17,785 inhabitants, of whom 1171 are ſlaves. The ſoil is very fertile, and its fruits and other productions meet with a quick ſale in New-York city. Eſſex county has within it 7 Preſbyterian churches, 3 for Epiſcopalians, 1 for Anabaptiſts, and 2 for Dutch Calvaniſts.—*ib.*

Essex *Co.* in Vermont, is the north-eaſternmoſt in the ſtate.—*ib.*

Essex, a townſhip in Chittenden co. Vermont, contains 354 inhabitants. It lies between Jericho on the S. E. and Colcheſter on the N. W.—*ib.*

ESTAPA, or *Eſtape*, a town belonging to the province of Tabaſco, and audience of Mexico, in New-Spain, N. America. It is mentioned by Dampier, as ſituated on Tabaſco river, 4 leagues beyond Villa de Moſe. It is ſaid to be a place of conſiderable trade; and ſo ſtrong, that it repulſed capt. Hewet, when he attacked it with 200 deſperate buccaneers.—*ib.*

ESTAPO, a ſtrong town in New-Spain, inhabited by Spaniards and native Americans; ſituated at the mouth of the river Tlaluc. N. lat. 17. 30. W. long. 103. 5.—*ib.*

ESTHER *Town*, in Lancaſter co. Pennſylvania, ſituated on the E. bank of Suſquehanna river, a little N. of Harriſburg.—*ib.*

ETON is a place which, on account of its college, ſhould not be omitted in a repoſitory of arts, ſciences, and literature; and as no notice is taken of it in the *Encyclopædia*, we ſhall deviate for once from the plan which we had laid down for this Supplement, and which is, not to admit into it deſcriptions of places in our own iſland that may be viſited by the greater part of our readers with little trouble.

Though in a different county, namely, Buckinghamſhire, Eton may be ſaid to be one and the ſame town with Windſor, for which ſee *Encycl.* It is pleaſantly ſituated on the banks of the Thames, in a delightful valley, which is of a remarkably healthy ſoil. Its college was founded by Henry VI. for the ſupport of a provoſt and ſeven fellows, one of whom is vice-provoſt, and for the education of ſeventy King's ſcholars, as thoſe are called, who are on the foundation. Theſe, when properly qualified, are elected, on the firſt Tueſday in Auguſt, to king's college Cambridge, but they are not removed till there are vacancies in the college, and then they are called according to ſeniority; and after they have been three years at Cambridge, they claim a fellowſhip. Beſides thoſe on the foundation, there are ſeldom leſs than three hundred ſcholars, and often many more, who board at the maſters houſes, or within the bounds of the college. The ſchool is divided into upper and lower, and each of theſe into three claſſes. To each ſchool there is a maſter and four aſſiſtants or uſhers. The revenue of the college is about

£.5000 a-year. Here is a noble library, and in the great court is a fine ſtatue of the founder, erected at the expence of a late provoſt Dr Godolphin dean of St Paul's. The chapel is in a good ſtyle of Gothic architecture. The ſchools and other parts, which are in the other ſtyle of building, are equally well, and ſeem like the deſign of Inigo Jones.

At Eton there is a ſingular, and we think a laudable, feſtival, called the *Montem*, celebrated triennially (formerly duennially) by the ſcholars of the ſchool upon Whit-Tueſday. The following account of this feſtival, taken from the Monthly Magazine, will probably be acceptable to many of our readers.

It commences by a number of the ſenior boys taking poſt upon the bridges or other leading places of all the avenues around Windſor and Eton ſoon after the dawn of day. Theſe youths ſo poſted are chiefly the beſt figures, and the moſt active of the ſtudents; they are all attired in fancy dreſſes of ſilks, ſatins, &c. and ſome richly embroidered, principally in the habits or faſhion of running footmen, with poles in their hands; they are called *ſalt-bearers*, and demand ſalt, i. e. a contribution from every paſſenger, and will take no denial.

When the contribution is given, which is *ad libitum*, a printed paper is delivered with their motto and the date of the year, which paſſes the bearer free through all other ſalt-bearers for that day, and is as follows, viz.

"Pro more et monte,
1799, (A)
Vivant Rex et Regina."

Theſe youths continue thus collecting their ſalt at all the entrances for near ſeven miles round Windſor and Eton, from the dawn of day until about the cloſe of the proceſſion, which is generally three o'clock in the afternoon.

The proceſſion commences about twelve o'clock at noon, and conſiſts of the Queen's and other bands of muſic; ſeveral ſtandards borne by different ſtudents; all the Etonian boys, two and two, dreſſed in officers uniforms; thoſe of the king's foundation wearing blue, the others ſcarlet uniforms, ſwords, &c.

The Grand Standard-bearer.

The Captain, or Head Boy of Eton School.

The Lieutenant, or Second Boy.

His Majeſty, attended by the Prince of Wales, and other male branches of the royal family on horſeback, with their ſuite.

The Queen and Princeſſes in coaches, attended by their ſuite.

Band of muſic, followed by a great concourſe of the Nobility and Gentry in their carriages and on horſeback.

The proceſſion commences in the great ſquare at Eton, and proceeds through Eton to Slough, and round to Salt Hill, where the boys all paſs the king and queen in review, and aſcend the Montem: here an oration is delivered, and the grand ſtandard is diſplayed with much grace and activity by the ſtandard bearer, who is generally ſelected from among the ſenior boys.

There are two extraordinary ſalt-bearers appointed to attend the king and queen, who are always attired in fanciful habits, in manner of the other ſalt-bearers already deſcribed, but ſuperbly embroidered. Theſe ſalt-bearers carry each an embroidered bag, which not only receives the royal ſalt, but alſo whatever is collected by the out-ſtationed ſalt-bearers. The donation of the king and queen, or, as it is called upon this occaſion, the *royal ſalt*, is always fifty guineas each; the Prince of Wales thirty guineas; all the other princes and princeſſes twenty guineas each. As ſoon as this ceremony is performed, the royal family return to Windſor. The boys are all ſumptuouſly entertained at the tavern at Salt Hill; and the beautiful gardens at that place are laid out for ſuch ladies and gentlemen as chooſe to take any refreſhments, the different bands of muſic performing all the time in the gardens.

About ſix o'clock in the evening all the boys return in the ſame order of proceſſion as in the morning (with the exception only of the royal family), and, marching round the great ſquare in Eton ſchool, are diſmiſſed. The captain then pays his reſpects to the royal family at the queen's lodge, Windſor, previous to his departure for King's College, Cambridge; to defray which expence, the produce of the montem is preſented to him; and upon Whit-Tueſday, in the year 1796, it amounted to more than 1000 guineas. The day concludes by a brilliant diſplay of beauty, rank, and faſhion, a promenade on Windſor Terras, bands of muſic performing, &c. and the ſcene highly enlivened and enriched by the affable condeſcenſion of the royal family, who indiſcriminately mix with the company, and parade the Terrace till nearly dark.

EVANSHAM, the capital of Wythe co. in Virginia, is ſituated on the E. ſide of Reedy creek, which falls into the Great Kanhaway, Woods or New river. It contains a court-houſe, gaol, and about 25 houſes; 40 miles W. by S. of Chriſtianſburg, 242 in a like direction from Bichmond, and 518. S. W. by W. of Philadelphia.—*Morſe.*

SPONTANEOUS EVAPORATION. See WEATHER, n° 17, &c. *Encycl.*

EUDIOMETER, an inſtrument for aſcertaining the purity of the atmoſpherical air. Many have been the contrivances of chemiſts for this purpoſe (ſee EUDIOMETER, *Encycl.*); but perhaps the beſt eudiometer is that of *Morveau* (or *Guyton*, as he now chooſes to call himſelf), of which mention has been made in CHEMISTRY, n° 420. in this Supplement. The following ſhort deſcription will make the nature and uſe of this inſtrument plain to every reader.

AB, (Plate XXVIII.) repreſents a ſmall glaſs retort with a long neck; its whole capacity being from ſeven to nine ſolid inches. It muſt be choſen of ſuch a curvature that, when the neck is ſet upright, the bulb may form at its lower part a cavity to retain the matters introduced. The extremity of the neck of this retort is ground with emery to enter the glaſs tube CD, which is open at both ends, and about 12 or 15 inches in length. The retort then cloſes the tube in the manner of a ground ſtopper, and intercepts all external communication. A cylindrical glaſs veſſel F is provided, of the form of a common jar, in which the glaſs tube CD may be entirely plunged beneath the level of the water. Laſtly, the ſulphuret of potaſh is prepared and broken

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(A) Or whatever the year may be.

broken into pieces ſufficiently ſmall to be introduced into the retort. Theſe are to be incloſed, dry and even hot, in a bottle for uſe. Theſe conſtitute the whole apparatus and preparation of materials.

When it is required to examine an aeriform fluid, by ſeparating its oxygen, two or three pieces of the ſulphuret, of the ſize of a pea, are put into the retort. It is then filled with water, taking care to incline it ſo that all the air may paſs out from the bulb. The orifice of the retort is then to be cloſed, and inverted into the pneumatic tube, in order that the gas propoſed for examination may be transferred into it in the uſual manner. By an eaſy manœuvre of alternately inclining the retort in different directions, all the water is made to flow out of the bulb in which the ſulphuret remains. When this is done, the retort is placed in the vertical ſituation, and its extremity introduced into the tube of glaſs CD, which muſt always be under water. A ſmall lighted taper is then to be placed under the bulb. To ſupport the retort in its poſition, the jar is provided with a wooden cover, in which there is a notch to receive it.

The firſt impreſſion of the heat dilates the gaſeous fluid ſo much that it deſcends almoſt to the bottom of the tube, which is diſpoſed expreſsly for its reception; otherwiſe the partial eſcape would prevent an accurate determination of its change of bulk. But as ſoon as the ſulphuret begins to boil, the water quickly riſes, not only in the inferior tube, but likewiſe in the neck of the retort, notwithſtanding the application, and even the increaſe of the heat.

If the fluid be abſolutely pure vital air, the abſorption is total. In this caſe, to prevent the rupture of the veſſel by too ſudden refrigeration, the aſcent of the water muſt be rendered ſlower, either by removing the taper, or by increaſing the perpendicular height; which will not prevent the abſorption from continuing while any gas remains which is proper to ſupport combuſtion.

If the fluid be common air, or oxygen mixed with any other gas, the quantity of water which has entered the retort muſt be accurately meaſured after the cooling. It repreſents the volume of air abſorbed. Care muſt be taken to incloſe the remaining gas under the ſame preſſure, by plunging the retort to the level of the line at which the incloſed water reſts, before the orifice is ſtopped.

This operation of meaſuring, which is very eaſy when meaſuring veſſels are at hand, may be habitually performed by a ſlip of paper paſted on the neck of the retort, upon which diviſions are drawn from obſervation, and which muſt be covered with varniſh to defend it from the action of the water.

EUDOXUS of Gnidus was a celebrated philoſopher of the ſchool of Pythagoras. His firſt preceptor was Archytas, by whom he was inſtructed in the principles of geometry and philoſophy. About the age of twenty-three he came to Athens; and though his patrimony was ſmall, by the generous aſſiſtance of Theomedon, a phyſician, he was enabled to attend the ſchools of the philoſophers, particularly that of Plato. The liberality of his friends afterwards ſupported him during a viſit to Egypt, where he was introduced by Ageſilaus to king Nectanebis II. and by him to the Egyptian prieſts. It has been ſaid that he accompanied Plato into Egypt; but this is inconſiſtent with chronology; for Nectanebis II. reigned in Egypt from the ſecond year of the hundred and fourth Olympiad, to the ſecond year of the hundred and ſeventh; and it was before Plato opened his ſchool, that is, before the ninety-eighth Olympiad, about the fortieth year of his age, that he viſited Egypt. Eudoxus is highly celebrated by the ancients for his ſkill in aſtronomy, but none of his writings on this or any other ſubject are extant. Aratus, who has deſcribed the celeſtial phenomena in verſe, is ſaid to have followed Eudoxus. He flouriſhed about the ninety-ſeventh Olympiad, and died in the fifty-third year of his age. *Enfield's Hiſt. of Philoſophy.*

EVECTION is uſed by ſome aſtronomers for the libration of the moon, being an inequality in her motion, by which, at or near the quadratures, ſhe is not in a line drawn through the centre of the earth to the ſun, as ſhe is at the ſyzygies, or conjunction and oppoſition, but makes an angle with that line of about 2° 51′. The motion of the moon about her axis only is equable; which rotation is performed exactly in the ſame time as ſhe revolves about the earth; for which reaſon it is that ſhe turns always the ſame face towards the earth nearly, and would do ſo exactly, were it not that her monthly motion about the earth, in an elliptic orbit, is not equable; on which account the moon, ſeen from the earth, appears to librate a little upon her axis, ſometimes from eaſt to weſt, and ſometimes from weſt to eaſt; or ſome parts in the eaſtern limb of the moon go backwards and forwards a ſmall ſpace, and ſome that were conſpicuous, are hid, and then appear again.

The term *evection* is uſed by ſome aſtronomers to denote that equation of the moon's motion which is proportional to the ſine of double the diſtance of the moon from the ſun, diminiſhed by the moon's anomaly. This equation is not yet accurately determined: ſome ſtate it at 1° 30′, others, at 1° 16′, &c. It is the greateſt of all the moon's equations, except the equation of the centre. *Hutton's Dictionary.*

EVENLY even number. See Number, *Encycl.*

Evenly Odd Number. See Number, *Encycl.*

EVESHAM, a townſhip in Burlington co. New-Jerſey, ſituated between the forks of Moore's creek, which runs N. weſterly to Delaware river. It is 7 miles eaſterly of Haddonfield, 16 E. of Philadelphia, and 25 S. of Burlington.

Here is an Indian ſettlement, called Edge Pelick, a tract of land reſerved by the ancient natives. They have ſome hundreds of acres of improved lands, about 30 houſes, and a meeting-houſe. They formerly had a miniſter of their own order, who ſtatedly officiated in the Indian language.—*Morse.*

EVOLVENT, in the higher geometry, a term uſed by ſome writers for the involute or curve reſulting from the evolution of a curve, in contradiſtinction to that evolute, or curve ſuppoſed to be opened or evolved. See Evolute and Involute, *Suppl.*

EVOLUTE, in the higher geometry, a curve firſt propoſed by Huyghens, and ſince much ſtudied by mathematicians. It is any curve ſuppoſed to be evolved or opened, by having a thread wrapped cloſe upon it, faſtened at one end, and beginning to evolve or unwind the thread from the other end, keeping the part evolved or wound off tight ſtretched; then this end of the thread will deſcribe another curve, called the *involute.* Or the ſame involute is deſcribed the contrary way, by wrapping the thread upon the evolute, keeping it always ſtretched. For the INVOLUTION and EVOLUTION *of Curves*, ſee INVOLUTION in this Supplement.

Imperfect EVOLUTE, a name given by M. Reaumur to a new kind of evolute. The mathematicians had hitherto only conſidered the perpendiculars let fall from the involute on the convex ſide of the evolute : but if other lines not perpendicular be drawn upon the ſame points, provided they be all drawn under the ſame angle, the effect will ſtill be the ſame ; that is, the oblique lines will all interſect in the curve, and by their interſections form the infinitely ſmall ſides of a new curve, to which they would be ſo many tangents. Such a curve is a kind of evolute, and has its radii ; but it is an imperfect one, ſince the radii are not perpendicular to the firſt curve or involute.

EUPHON, a muſical inſtrument invented lately by Dr Chladni of Wittenberg, well known by his various publications on philoſophical ſubjects, eſpecially the theory of muſical ſounds. The euphon conſiſts of forty-two immoveable parallel cylinders of glaſs of equal length and thickneſs ; but its conſtruction, tone, and the method of playing it, are totally different from thoſe of the harmonica, with which indeed it has nothing in common but the glaſs. See HARMONICA, *Encycl.*

Dr Chladni gives the following account of his invention. In his 19th year he began to learn to play the harpſichord ; and he afterwards read a great many of the principal works on the theory of muſic, by which he found that the phyſico-mathematical part of that ſcience was far more defective than other branches of natural philoſophy. Being therefore poſſeſſed with an idea that his time could not be better emyloyed than in endeavouring to make diſcoveries in this department, he accordingly tried various experiments on the vibrations of ſtrings and the different kinds of vibration in cylindric pieces of wood, firſt diſcovered, through calculation by the elder Euler ; and found, that though a great deal had been ſaid on the nature of theſe elaſtic bodies, yet the manner of vibration and the proportion of tones in other elaſtic bodies, which do not proceed, as in the former, in ſtraight lines, but depend on the vibration of whole ſurfaces, were totally unknown, and that the little which had been written on that ſubject, by ſome authors, did not correſpond with nature. He had already long remarked, that every plate of glaſs or metal emitted various tones according as it was held and ſtruck in different places ; and he was deſirous to diſcover the cauſe of this difference, which no one had ever examined. He fixed in a vice the axle of a braſs plate which belonged to a poliſhing machine, and found, that by drawing the bow of a violin over it, he produced very different tones, which were ſtronger, and of longer duration than thoſe obtained merely by ſtriking it.

The obſervation, that not only ſtrings, but alſo other elaſtic bodies may be made to produce ſounds by drawing a violin bow over them, Dr Chladni does not give as a diſcovery of his own ; as the ſo called iron violin has been long known, and as he had read of an inſtrument conſtructed in Italy*, where glaſs or metal bells were made to ſound by means of two or more violin bows drawn over them. But the idea of employing this inſtrument to examine vibrating tones was firſt entertained by himſelf. Having accurately remarked the tones produced by the abovementioned metal plate, he found that they gave a progreſſion which correſponded with the ſquares of 2, 3, 4, &c.

Not long before he had read, in the Tranſactions of the Royal Society of Gottingen, the obſervations of Mr Lichtenberg on the phenomena produced by ſtrewing pounded reſin over a glaſs plate or cake of reſin, and he repeated many of his experiments. This led him to the idea that, perhaps, the various vibratory movements of ſuch a plate would be diſcovered by a diverſity of phenomena, if he ſtrewed over it ſand or any thing of the like kind. By this experiment there was produced a ſtar-formed figure ; and the author, having continued his reſearches, publiſhed the reſult of them in a work entitled Diſcoveries reſpecting the Theory of Sound, printed at Leipſic in 1787.

Whilſt he was employed in theſe inveſtigations, he reſolved to invent a new muſical inſtrument ; and he began to conſider whether it might not be poſſible by rubbing glaſs tubes in a ſtraight line, with the wet fingers, to produce ſounds in the ſame manner as is done in the harmonica by rubbing them circularly. That glaſs tubes, like thoſe in his euphon, would not merely by ſuch rubbing emit any tones, he had long known by theory and experience ; and he therefore applied himſelf to the ſolution of the difficult queſtion, in what manner the inſtrument ought to be conſtructed to anſwer the intended purpoſe ? After various fruitleſs attempts for a year and a half, during which his imagination was ſo full of the idea, that ſometimes in his dreams he thought he ſaw the inſtrument and heard its tones, that is, like thoſe of the harmonica, but with more diſtinctneſs and leſs confuſion, he at length, in a ſtate between ſleeping and waking, obtained a ſolution of the problem which had given ſo much employment to his thoughts. On the ſecond of June 1789, being tired with walking, he ſat down on a chair, about nine in the evening, to enjoy a ſhort ſlumber ; but ſcarcely had he cloſed his eyes when the image of an inſtrument, ſuch as he wiſhed for, ſeemed to preſent itſelf before him, and terrified him ſo much that he awoke as if he had been ſtruck by an electric ſhock. He immediately ſtarted up in a kind of enthuſiaſm ; and made a ſeries of experiments, which convinced him that what he had ſeen was perfectly right, and that he had it now in his power to carry his deſign into execution. He made his experiments and conſtructed his firſt inſtrument in ſo private a manner, that no perſon knew any thing of them. On the 8th of March 1790 his firſt inſtrument of this kind was completed ; and in a few days he was able to play on it ſome eaſy pieces of muſic. It was now neceſſary to give to this inſtrument, as it was entirely new, a new name ; and that of *euphon*, which ſignifies an inſtrument that has a pleaſant ſound, appeared to him the moſt proper.

It was not, however, brought to perfection at once, for he made a ſecond inſtrument which was an improvement of the firſt, and a third which was an improvement of the ſecond. In ſound, indeed, and particularly in the higher tones, the firſt was equal to either of the other two ; but the conſtruction was deficient in ſtrength, ſo that every week ſome hours were neceſſary to keep it in proper repair ; and it was impoſſible to convey it the diſtance of a mile without almoſt totally deſtroying it. Dr Chladni alſo, for want of better tubes, employed thoſe uſed for thermometers, and

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* In all probability the *Harmonica* of the Abbé Mazzuchi.

marked the whole and half tones by a coating of ſeal-wax on the under ſide; but as the wax, owing to the moiſture and vibration, often cracked and flew off, it was attended with danger to the eyes. It was therefore extremely difficult to give to the conſtruction of the inſtrument ſufficient ſtrength; but this the inventor at length accompliſhed, ſo that his new euphon cannot be injured or put out of tune either by playing or by carriage. The third inſtrument was ſomewhat different from the firſt and ſecond; as the fore part, which in the two former roſe upwards with an oblique angle, ſtood at right angles, ſo that it could be tranſported with eaſe in a particular carriage made for that purpoſe. Inſtead of the thermometer tubes uſed in the firſt, the Doctor now employs tubes of different colours. In the ſecond inſtrument thoſe for the whole tones were of dark green glaſs; but he uſed for the half tones, in both, a milk white kind of glaſs. In a word, the euphon has ſome reſemblance to a ſmall writing-deſk. When opened, the abovementioned glaſs tubes, of the thickneſs of the barrel of a quill and about 16 inches long, are ſeen in a horizontal poſition. They are wetted with water, by means of a ſponge, and ſtroked with the wet fingers in the direction of their length, ſo that the increaſe of the tone depends merely on the ſtronger or weaker preſſure, and the ſlower or quicker movement of the fingers. The number of tubes at preſent is forty-two. In the back part there is a perpendicular ſounding-board divided in the middle, through which the tubes paſs. It appears therefore that the euphon ought not to be conſidered as an altered or improved harmonica, but as a totally new and different inſtrument. In regard to ſweetneſs of ſound, it approaches very near to the harmonica; but it has ſeveral advantages which no unprejudiced perſon, who examines both inſtruments, will deny.

1. It is ſimpler, both in regard to its conſtruction and the movement neceſſary to produce the ſound, as neither turning nor ſtamping is required, but merely the movement of the finger. 2. It produces its ſound ſpeedier; ſo that as ſoon as it is touched you may have the tone as full as the inſtrument is capable of giving it; whereas, in the harmonica, the tones, particularly the lower ones, muſt be made to increaſe gradually. 3. It has more diſtinctneſs in quick paſſages, becauſe the tones do not reſound ſo long as in the harmonica, where the ſound of one low tone is often heard when you wiſh only to hear the following tone. 4. The uniſon is purer than is generally the caſe in the harmonica, where it is difficult to have perfect glaſſes, which in every part give like tones with mathematical exactneſs. It is however as difficult to be tuned as the harmonica. 5. It does not affect the nerves of the performer; for a perſon ſcarcely feels a weak agitation in the fingers; whereas in the harmonica, particularly in concords of the lower notes, the agitation extends to the arms, and even through the whole body of the performer. 6. The expence of this inſtrument will be much leſs in future than that of the harmonica. 7. When one of the tubes breaks or any other part is deranged, it can be ſoon repaired, and at very little expence; whereas, when one of the glaſſes of the harmonica breaks, it requires much time, and is very difficult to procure another capable of giving the ſame tone as the former, and which will correſpond ſufficiently with the ſeries of the reſt.

EUPHORBIA (See *Encycl.*). Of this plant three new ſpecies were diſcovered by Le Vaillant during his laſt travels into the interior parts of Africa. The firſt, which he calls the Cucumber-Euphorbia, adheres to the earth no otherwiſe than by a few ſlender roots. Plate XXVIII. fig. 1. It riſes to the height of nine or ten inches only; and exactly reſembles a cucumber, of which it has the bent ſhape. It contains abundance of milky juice, which appeared to him as cauſtic as that of the great euphorbia. Its colour, which is a yellowiſh green, tinted with a beautiful ſhade of violet towards the root, gives it a very attractive appearance: but woe betide the man who ſhould be tempted to eat of it! as it is a virulent poiſon. Fig. 2. The ſecond, to which he gave the name of the Melonribbed Euphorbia, does not riſe more than three or four inches from the ground, to which it adheres by a collection of fibrous roots, iſſuing from ſeveral tubercles diſpoſed in the manner of a crown. The ſtem forms a flatted globe excavated at the ſummit, and has ribs like the apple which in France is called *calville blanche*. Theſe ribs are elevated, thick, and convex, have a greeniſh colour, and are marked with brown tranſverſal bands. From the ſummit of the ribs iſſue ſeveral little tufts of pedunculate flowers. Fig. 3. The third he called the Caterpillar-Euphorbia, becauſe when he firſt found it, he thought he perceived on it ſeveral beautiful caterpillars. The deſcription of it in a few words is as follows: From a very large tuberous root, which here and there throws out a few thready fibres, iſſue ſeveral ſtalks almoſt of the length of the finger: they creep along the ground, are twiſted, woody, deſtitute of leaves, and furniſhed with ſeveral rows of round tubercles, each guarded by two prickles.

All theſe kinds of euphorbia are to be dreaded, the laſt two in particular; becauſe being low and mixed with the herbage like muſhrooms, animals, as they feed, run the riſk of eating them with their paſture. Our author confirms the account which has been given in the *Encyclopædia* of the ſavages poiſoning the reſervoirs of water with this plant in order to procure the game which ſhall drink of it. To effect the death of the animal, it is neceſſary that the poiſon reach the blood and mingle with it. Yet, inconceivable as it may be, the animal, though poiſoned, is not the leſs wholeſome food, as our author ſays he has experienced. However great may be the proportion of euphorbia thrown into a pond of water, he is perſuaded that it never diffuſes itſelf through the whole maſs. It is his opinion, that the poiſon is a reſinous juice, which, being from its nature incapable of combining with water, ſwims on the ſurface, and there forms a ſhining greeniſh oil, which with a little attention may be diſcerned by the naked eye when the ſurface is ſmooth. I tried (ſays he) the qualities of this oil on myſelf, taking with a ſtraw, from the ſurface of the baſin, a ſingle drop, which I put upon my tongue; and it gave me that kind of burning pain which a cauſtic occaſions. I then took up ſome water from the reſervoir in the hollow of my hand, and blowing off the oily fluid which ſwam on the ſurface, I dipped the end of my tongue into the remainder, but could not perceive in it the ſlighteſt taſte different from that of water itſelf. He ſeems to think that milk is an antidote to the poiſon of euphorbia; becauſe he ſqueezed ſome of the juice into a baſon of milk and gave it to an ape, which ſwallowed part of it without the leaſt injury. He confeſſes, however, that the doſe was trifling.

EUSTACE, or *Euſtacia*, called alſo Metanzas, or Slaughter, (from a butchery made on it by the Spaniards). It is an inconſiderable iſland, about 20 miles in circuit. It forms, with a long point of land, the entrance to the harbor of St. Auguſtine, in Eaſt-Florida—*Morſe*.

EUSTYLE, is the beſt manner of placing columns, with regard to their diſtance; which, according to Vitruvius, ſhould be four modules, or two diameters and a quarter.

EXCENTRIC, or EXCENTRIC CIRCLE, in the ancient Ptolomaic aſtronomy, was the very orbit of the planet itſelf, which it was ſuppoſed to deſcribe about the earth, and which was conceived excentric with it; called alſo the deferent.

Inſtead of theſe excentric circles round the earth, the moderns make the planets deſcribe elliptic orbits about the ſun; which accounts for all the irregularities of their motions, and their various diſtances from the earth, &c. more juſtly and naturally.

EXCENTRIC, or *Excentric Circle*, in the new aſtronomy, is the circle deſcribed from the centre of the orbit of a planet, with half the greateſt axis as a radius; or it is the circle that circumſcribes the elliptic orbit of the planet.

EXCHANGE. See *Encycl.* under that word, and likewiſe under *BILLS of Exchange*, where the antiquity of ſuch bills, eſpecially among the Chineſe, is mentioned. In Profeſſor Beckmann's hiſtory of inventions the reader will find an ordinance of the year 1394 concerning the acceptance of bills of exchange, and alſo copies of two bills of the year 1404, which ſufficiently prove that the method of tranſacting buſineſs by bills of exchange was fully eſtabliſhed in Europe ſo early as the fourteenth century; and that the preſent form and terms were even then uſed. The ordinance, which was iſſued by the city of Barcelona, decreed that bills of exchange ſhould be accepted within twenty-four hours after they were preſented, and that the acceptance ſhould be written on the back of the bill.

But there are queſtions relating to bills of exchange of much greater importance than their antiquity; and theſe queſtions are not yet decided. For inſtance, Ought a bill of exchange to be conſidered by the law merely as a *depoſit* belonging to the drawer, and ſucceſſively confided to the remittees? or ſhould it be conſidered as transferable *property*, at all times abſolutely veſted in the holder, whoſe neglect therefore, when it vitiates the value, falls wholly on himſelf?

In a work publiſhed 1798 by Profeſſor Buſch of Hamburgh, entitled, *Additions to the Theoretical and Practical Delineation of Commerce* (A), the reader will find ſome arguments, which, to ſay the leaſt of them, are certainly plauſible, to prove that bills of exchange ought to be at all times conſidered as the abſolute property of the holder. This theory is then applied to the difficult and ſtill unſettled caſe of the holder of a bill having many indorſements, where the drawer, drawee, and early indorſers, have all failed. It is evident that, if the holder proves under each bankruptcy the whole amount of the bill, he will receive much more than his due. May he make his election where to prove the whole demand, and where to prove the reſidue? Or ought he not (which ſeems moſt equitable) to be compelled to prove his debt againſt his immediate predeceſſor only?—the aſſignees of that predeceſſor proving, in their turn, in like manner (each party once only), back to the drawer. This is a caſe of great importance to diſcounters, and the reader will find ſome judicious obſervations on it in the Profeſſor's work.

EXEGESIS, or EXEGETICA, in algebra, is the finding, either in numbers or lines, the roots of the equation of a problem, according as the problem is either numeral or geometrical.

EXETER, a poſt town in Rockingham co. New-Hampſhire, and, next to Portſmouth, the moſt conſiderable ſea-port town in the ſtate. It is ſituated at the head of navigation on Swamſcot, or Exeter river, a branch of the Piſcataqua, 15 miles S. W. of Portſmouth, and a like diſtance N. W. of Newburyport, in Eſſex co. Maſſachuſetts. The tide riſes here 11 feet. It is well ſituated for a manufacturing town, and has already a duck manufactory in its infancy, 6 ſaw mills, a fulling mill, ſlitting mill, paper mill, ſnuff mill, 2 chocolate and 10 griſt mills, iron works, and 2 printing offices. The ſaddlery buſineſs is carried on here to greater extent, than in any town on this ſide Philadelphia. Before the revolution, ſhip building was a profitable buſineſs; and the veſſels were employed in the Weſt-India trade. Notwithſtanding the loſs of this market, there are four or five veſſels, of different burden, built here annually; the river being capable of floating down thoſe of 500 tons. An equal number is alſo employed in the foreign trade, chiefly to the Weſt-Indies. The ſituation of this place bids fair for extenſive population. The public edifices are 2 Congregational churches, an elegant building appropriated for the academy, a handſome and capacious court-houſe, and a gaol. The public offices of the ſtate are kept here at preſent. Beſides the celebrated Exeter academy, there are here an Engliſh ſchool and 6 or 8 private ſchools, chiefly for females.

This townſhip is of irregular figure, and about 4 miles ſquare. It was incorporated in 1638; prior to which, it had the name of Swamſcot Falls, from the falls of the river, which ſeparate the freſh from the tide water; where the body of the town is ſituated; chiefly on the weſtern ſide of the river. The number of inhabitants in 1775, was 1741—and in 1790, 1722. It lies 54 miles N. of Boſton, and 402 N. E. of Philadelphia. N. lat. 42. 59. W. long. 71.

“Phillips Exeter Academy” was founded and endowed by the hon. John Phillips, L. L. D. of Exeter, and incorporated by act of Aſſembly in 1781. It is a very reſpectable and uſeful inſtitution, under the inſpection of a board of truſtees, and the immediate government and inſtruction of a preceptor and an aſſiſtant. It has a fund of £.15,000, a part of which is in lands not yet productive. The preſent annual income is £.489.

(A) Profeſſor Buſch publiſhed in 1792 a work entitled *A Theoretical and Practical Delineation of Commerce.*

£.480. It has commonly between 50 and 60 ſtudents. In 1794, a building was erected, 76 by 36 feet, two ſtories high; which, in point of convenience, and perhaps elegance, is exceeded by few buildings of the kind in the United States.—*Morſe.*

Exeter, the N. weſternmoſt townſhip in Waſhington co. Rhode-Iſland ſtate, has North-Kingſton on the E. and Voluntown, in Connecticut, on the W. The ſeveral branches of Wood river unite here, and take a S. courſe between Hopkinton and Richmond. It contains 2495 inhabitants, of whom 37 are ſlaves.—*ib.*

Exeter, a townſhip in Luzern co. Pennſylvania. —*ib.*

Exeter, a town in New-Hanover co. in Wilmington diſtrict, N. Carolina; ſituated on the N. E. branch of Cape Fear, about 36 miles N. from Wilmington, and 22 from the New river.—*ib.*

EXPECTATION of Life, in the doctrine of life annuities, is the ſhare, or number of years of life, which a perſon of a given age, may, upon an equality of chance, expect to enjoy.

By the expectation or ſhare of life, ſays Mr Simpſon (*Select Exerciſes*, p. 273), is not here to be underſtood that particular period which a perſon hath an equal chance of ſurviving; this laſt being a different and more ſimple conſideration. The expectation of a life, to put it in the moſt familiar light, may be taken as the number of years at which the purchaſe of an annuity, granted upon it, without diſcount of money, ought to be valued. Which number of years will differ more or leſs from the period abovementioned, according to the different degrees of mortality to which the ſeveral ſtages of life are incident. Thus it is much more than an equal chance, according to the table of the probability of the duration of life which the ſame author has given us, that an infant, juſt come into the world, arrives not to the age of ten years; yet the expectation or ſhare of life due to it, upon an average, is near twenty years. The reaſon of which wide difference is the great exceſs of the probability of mortality in the firſt tender years of life, above that reſpecting the more mature and ſtronger ages. Indeed if the numbers that die at every age were to be the ſame, the two quantities above ſpecified would alſo be equal; but when the ſaid numbers become continually leſs and leſs, the expectation muſt of conſequence be the greater of the two.

EXPONENTIAL Calculus, the method of differencing, or finding the fluxions of exponential quantities, and of ſumming up thoſe differences, or finding their fluents.

Exponential *Curve*, is that whoſe nature is defined or expreſſed by an exponential equation; as the curve denoted by $a^x = y$, or by $x^x = y$.

Exponential *Equation*, is one in which is contained an exponential quantity: as the equation $a^x = b$, or $x^x = ab$, &c.

Exponential *Quantity*, is that whoſe power is a variable quantity, as the expreſſion a^x, or x^x. Exponential quantities are of ſeveral degrees and orders according to the number of exponents or powers, one over another.

EXTRA Constellary Stars, ſuch as are not properly included in any conſtellation.

EXTRA-Mundane Space, is the infinite, empty, void ſpace, which is by ſome ſuppoſed to be extended beyond the bounds of the univerſe, and conſequently in which there is really nothing at all. The phraſe *extramundane ſpace* has been ſo long in uſe among our beſt writers, that it is now impoſſible to baniſh it from the language; and yet it has been the ſource of ſome extravagant miſtakes. Many philoſophers conſider ſpace as ſomething *real*, diſtinct both from body and mind; and no leſs a man than Dr Clarke conſidered it as an attribute of the Deity. Yet we think nothing more evident than that if body had never exiſted, ſpace would never have been thought of; and if this be ſo, extramundane ſpace, inſtead of denoting any *real* thing, or attribute infinitely extended, can mean nothing more than the *poſſibility* of enlarging the corporeal univerſe, however widely extended it may be. See Metaphysics (*Encycl.*), Part II. ch. iv.

EXTRADOS, the outſide of an arch of a bridge, vault, &c. See Arch in this *Supplement*.

EXTREMES Conjunct, and *Extremes Disjunct*, in ſpherical trigonometry are, the former the two circular parts that lie next the aſſumed middle part; and the latter are the two that lie remote from the middle part. Theſe were terms applied by Lord Napier in his univerſal theorem for reſolving all right-angled and quadrantal ſpherical triangles, and publiſhed in his *Logarithmorum Canonis Deſcriptio*, an. 1614. In this theorem, Napier condenſes into one rule, in two parts, the rules for all the caſes of right angled ſpherical triangles, which had been ſeparately demonſtrated by Pitiſcus, Lanſbergius, Copernicus, Regiomontanus, and others. In this theorem, neglecting the right angle, Napier calls the other five parts circular parts, which are, the two legs about the right angle, and the complements of the other three, viz. of the hypothenuſe, and the two oblique angles. Then taking any three of theſe five parts, one of them will be in the middle between the other two, and theſe two are the extremes conjunct when they are immediately adjacent to that middle part, or they are the extremes disjunct when they are each ſeparated from the middle one by another part.

EXUMA *Iſle*, one of the Bahama iſles, ſituated on the E. of the Great Bank, between Stocking iſles on the S. W. and Long-iſle on the E. It is now uninhabited, excepting two families, yet is one of the beſt of the Bahamas, not only for its fertility, but for the excellence of its anchoring ground, in the ſound to which it gives name; where all the Britiſh navy could ride in ſafety. N. lat. 24. 30. W. long. 74. 30.—*Morſe.*

Exuma *Sound*, lies E. of the Great Bahama Bank, between it and the iſle of Guanahani. N. lat. 24. W. long. 75.—*ib.*

F.

FABIANE, a river in Louiſiana, which runs S. eaſtward into the Miſſiſſippi, in N. lat. 39. 30.; 16 miles above Jaſtioni river and 50 below the Iowa town and rapids.—*Morse.*

FABIUS, one of the military townſhips in New-York.—*ib.*

FACE or **Façade**, in architecture, is ſometimes uſed for the front or outward part of a building, which immediately preſents itſelf to the eye; or the ſide where the chief entrance is, or next the ſtreet, &c.—*ib.*

FAIRFAX *Co.* in Virginia, is about 25 miles long, and 18 broad; on the W. Bank of Potowmack river. It contains 12,320 inhabitants, of whom 4574 are ſlaves. Chief town, Alexandria.—*ib.*

Fairfax, a townſhip in Franklin co. Vermont, E. of Georgia, and on the bank of La Moille river, and contains 254 inhabitants; and is about 9 miles from lake Champlain.—*ib.*

FAIRFIELD, a plantation in Lincoln co. diſtrict of Maine, on the S. E. bank of Kennebeck river, S. of Canaan, and oppoſite Hancock; about 17 miles from Pittſtown, and 7 from Fort Halifax. It contains 492 inhabitants, and is 225 miles N. E. of Boſton.—*ib.*

Fairfield, a new townſhip in Herkemer county, New-York.—*ib.*

Fairfield, a townſhip in Franklin co. Vermont, E. of St. Albans; and contains 129 inhabitants. It is 13 miles S. of the Canada line, and as far from the neareſt part of lake Champlain.—*ib.*

Fairfield, a townſhip in Waſhington co. New-York. By the ſtate cenſus of 1796, 29 of its inhabitants are electors.—*ib.*

Fairfield, a townſhip in Cumberland co. New-Jerſey, on Cohanzy creek, and at the head of Black creek; 25 miles E. by S. of Salem, in Salem co.—*ib.*

Fairfield *Co.* in Connecticut, is the S. weſternmoſt in the ſtate; bounded W. by the ſtate of New-York, E. by New-Haven co. N. by Litchfield, and S. by Long-Iſland ſound. Its ſhape is very irregular. It is divided into 13 townſhips, of which Fairfield and Danbury are the chief; and contains 36,250 inhabitants, including 433 ſlaves. It is ſeparated from New-Haven co. and part of Litchfield co. by Stratford river. The other parts of the county are watered by ſmall ſtreams, as Sagatuck, Saſco, Peganook, Five Mile, Rodens, Mill, and Mayamus rivers. Several harbors, and a number of ſmall iſles lie along the ſound, in the towns of Greenwich, Stamford, Norwalk, Fairfield, and Stratford. The face of the county is rough, but the ſoil is good.—*ib.*

Fairfield, the *Unquowa* of the Indians, a poſt town and port of entry of Connecticut, and capital of the above county, is pleaſantly ſituated on Mill-Run, a little above its entrance into Long-Iſland ſound, 22 miles S. W. by W. of New-Haven, and 64 from New-York. It contains about 200 houſes, a neat Congregational church, and a court-houſe. About 4 miles N. W. of the body of the town, and in the townſhip, is the beautiful pariſh of Greenfield, in which is a flouriſhing academy. A high eminence in the centre of the pariſh commands a delightful proſpect. Fairfield was ſettled from Weathersfield in 1639, and in 1736 contained 400 families. It was burnt by a party of tories and Britiſh, under the command of gov. Tryon, in 1777; the loſs ſuſtained, amounted to upwards of £.40,000. Fairfield carries on a conſiderable trade to the W. Indies. The exports for one year, ending Sept. 30th, 1794, amounted to 77,425 dollars.—*ib.*

Fairfield, a townſhip in Weſtmoreland co. Pennſylvania.—*ib.*

Fairfield *Co.* in Camden diſtrict, S. Carolina, between Wateree river which divides it from Lancaſter co. and Broad river which ſeparates it from Newbury and Union counties. It contains 6138 white inhabitants, and 1485 ſlaves. Its chief town is Winnſborough.—*ib.*

FAIRHAVEN, in Briſtol co. Maſſachuſetts, lies on the N. W. ſide of Buzzard's bay, and on the eaſtern ſide of Accuſhnet river, oppoſite to Bedford.—*ib.*

Fairhaven, a conſiderable townſhip in Rutland co. Vermont, N. W. of Poultney. It contains 545 inhabitants, and is 51 miles N. of Bennington.—*ib.*

FAIRLEE, a townſhip in Orange co. Vermont, on the W. bank of Connecticut river, 16 miles N. of Dartmouth College. The townſhip is hilly, but of a good ſoil, and has ſeveral glades of excellent land. It contains 463 inhabitants.—*ib.*

FAIR WEATHER, **Cape**, on the E. coaſt of Patagonia, in S. America, lies northerly from Cape Virgin Mary. S. lat. 51. 45. W. long. from Greenwich 68. 10.—*ib.*

FALCONRY is a ſpecies of ſport, about the antiquity of which, there has been ſome diſpute. Under the word Hawking (*Encycl.*) we have deduced what we thought ſufficient evidence of its being practiſed among the Thracians, and likewiſe among the Britons before the invaſion of this iſland by the Romans. Flavius Blondus, however, and Laurentius Valla, both writers of the 15th century, and the latter, one of the moſt learned men of his time, affirm that no nation or people were accuſtomed to catch either land or water-fowls with any rapacious bird trained for the purpoſe.

We were pleaſed to ſee our own opinion, ſo different from this, completely eſtabliſhed by the learned labours of Profeſſor Beckmann. So early (ſays he) as the time of Cteſias (and he refers to the page and edition of his author) hares and foxes were hunted in India by means of rapacious birds. The account of Ariſtotle*, however, is ſtill more to the purpoſe, and more worthy of notice. "In Thrace (ſays he) the men go out to catch birds with hawks. The men beat the reeds and buſhes which grow in marſhy places, in order to raiſe the ſmall birds, which the hawks purſue and drive to the ground, where the fowlers kill them with poles." The ſame account is to be found in another book aſcrib-

* *Hiſt. Animal*, lib. ix. cap. 6.

ed alſo to Ariſtotle, and which appears, at any rate, to be the work of an author not much younger. Reſpecting Thrace, which is ſituated above Amphipolis, a wonderful thing is told, which might appear incredible to thoſe who had never heard it before. It is ſaid that boys go out into the fields, and purſue birds by the aſſiſtance of hawks. When they have found a place convenient for their purpoſe, they call the hawks by their names, which immediately appear as ſoon as they hear their voices, and chaſe the birds into the buſhes, where the boys knock them down with ſticks and ſeize them. What is ſtill more wonderful, when theſe hawks lay hold of any birds themſelves, they throw them to the fowlers; but the boys, in return, give them ſome ſhare of the prey. *De mirabilibus auſcultat.* cap. 128.

In this paſſage, there are two additions which render the circumſtance ſtill more remarkable. The firſt is, that the falcons appeared when called by their names; and the ſecond, that of their own accord they brought to the fowlers whatever they caught themſelves. Nothing is here wanting but the Spaniel employed to find out game, the hood which is put upon the head of the hawk while it ſtands on the hand, and the thong uſed for holding it, to form a ſhort deſcription of falconry as ſtill practiſed. Our falconers, when they have taken the bird from the hawk, give him, in return, a ſmall ſhare of it; and in the like manner the Thracian hawks received ſome part of their booty.

Other writers after Ariſtotle, ſuch as Antigonus, Ælian, Pliny, and Phile, have alſo given an account of this method of fowling. Ælian, who ſeldom relates any thing without ſome alteration or addition, ſays, that in Thrace nets were uſed, into which the birds were driven by the hawks; and in this he is followed by the poet Phile. Ælian, alſo, in another place deſcribes a manner of hunting with hawks in India, which, as we are told by ſeveral travellers, is ſtill practiſed in Perſia, where it is well underſtood, and by other eaſtern nations.

The Indians (ſays he) hunt hares and foxes in the following manner: They do not employ dogs, but eagles, crows, and, above all, kites, which they catch when young, and train for that purpoſe. They let looſe a tame hare or fox, with a piece of fleſh faſtened to it, and ſuffer theſe birds to fly after it, in order to ſeize the fleſh, which they are fond of, and which, on their return, they receive as the reward of their labour. When thus inſtructed to purſue their prey, they are ſent after wild foxes and hares in the mountains; theſe they follow in hopes of obtaining their uſual food, and ſoon catch them and bring them back to their maſters, as we are informed by Cteſias. Inſtead of the fleſh, however, which was faſtened to the tame animals, they receive as food the entrails of the wild ones which they have caught.

It ſeems, therefore, that the Greeks received from India and Thrace the firſt information reſpecting the method of fowling with birds of prey; but it does not appear that this practice was introduced among them at a very early period. In Italy, however, it muſt have been very common, for Martial and Apuleius ſpeak of it as a thing every where known; the former calls a hawk the fowler's ſervant.

The Profeſſor traces the hiſtory of this art with great learning down to the preſent time. It was carried to the higheſt perfection at the principal courts of Europe (he ſays) in the 12th century, when the ladies kept hawks, which were as much fondled by thoſe who wiſhed to gain their favour as lap-dogs are at preſent. Among the oldeſt writers on falconry as an art he reckons Demetrius, who about the year 1270 was phyſician to the Emperor Michael Paleologus. His book, written in Greek, was firſt printed at Paris in 1612 with a Latin tranſlation; but its precepts (ſays our author) would be thought of very little value at preſent. For an account of the modern art of falconry ſee *Encyclopædia.*

FALK (John Peter), known to the world as one of the ſcientific travellers employed by the late Empreſs of Ruſſia to explore her vaſt dominions, was born in Weſtrogothia, a province in Sweden, about the year 1727. He ſtudied medicine in the univerſity of Upſal, and went through a courſe of botany under the celebrated Linnæus, to whoſe ſon he was tutor. He publicly defended the diſſertation (A) which that famous botaniſt had compoſed on a new ſpecies of plants, which he called *aſtromeria.*

In the year 1760, he was ſo deeply affected with depreſſion of ſpirits, that M. de Linné, in the view of obliging him to take exerciſe and diſſipation, ſent him to travel over the iſland of Gothland, to make a collection of the plants it produces, and the various kinds of corals and corallines which the ſea leaves on its ſhores. This voyage was attended with no diminution of his diſtemper, which found a continual ſupply of aliment in a ſanguine melancholy temperament, in a too ſedentary way of life, and in the bad ſtate of his finances.

Profeſſor Forſkael having left Upſal for Copenhagen in 1760, Falk followed him thither in the deſign of applying, by the advice of M. de Linné, to be appointed aſſiſtant to M. Forſkael in his famous journey thro' Arabia; but, notwithſtanding all the pains that M. Œder, and ſeveral other men of literary reputation at Copenhagen, took in his behalf, his application failed, as the ſociety that were to go on that important expedition was already formed. Obliged, with much diſcontent, to return, he herboriſed as he travelled, and enriched the Flora Suecica with ſeveral new diſcoveries.

A man in office at St Peterſburgh having written to M. Linné to ſend him a director for his cabinet of natural hiſtory, M. Falk accepted the poſt, which led him to the chair of profeſſor of botany at the apothecaries garden at St Peterſburg, a place that had been long vacant. His hypocondriac complaint ſtill continued to torment him. When the Imperial academy of ſciences was preparing in 1768 the plan of its learned expeditions, it took M. Falk into its ſervice, though his health was uncertain. He was recalled in 1771; but having got only to Kaſan in 1773, he there obtained permiſſion to go and uſe the baths of Kiſliar, from which he returned again to Kaſan at the end of the year, with his health apparently better.

But his diſeaſe ſoon returned with redoubled violence. From the month of December 1773, he had never

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(A) In the collection known under the title of *Linnæi Amœnitates Academicæ.*

never quitted his bed, nor taken any other nouriſhment than bread dried in the Swediſh manner (knækebrœd), of which he ſcarcely took once a day ſome mouthfuls dipped in tea. At firſt he received the viſits of a few friends, but afterwards denied himſelf to them, and was reduced to the ſtricteſt ſolitude. When M. Georgi, member of the ſociety of natural hiſtory at Berlin, who had been deſtined to aſſiſt and relieve the profeſſor in the duties of his expedition, went to ſee him on this occaſion, nothing ſeemed left of him but a ſkeleton of a wild and terrifying aſpect. The few words he drew from him conſiſted in complaints, occaſioned by a hoſt of diſeaſes which kept his body in torture, and threw him into the moſt cruel ſleepleſſneſs. The laſt evening M. Georgi kept him company till midnight. He ſpoke little, and ſaid nothing that could give reaſon to ſuſpect the deſign he was meditating. His hunter, and at the ſame time his truſty ſervant, offered to ſit up with him the night; but he could not be perſuaded to conſent.

M. Georgi being requeſted the next day, March 31, to come to the lodging of the unfortunate gentleman, he found him lying before his bed, covered with blood; beſide him lay a razor, with which he had given himſelf a ſlight wound in the throat, the fatal piſtol, and a powder horn; all together preſenting a tremendous ſpectacle. He had put the muzzle of the piſtol againſt his throat, and reſting the pommel upon his bed, he diſcharged the contents in ſuch a manner, that the ball, having gone through his head, had ſtuck in the ceiling. His ſoldier had ſeen him ſtill ſitting up in his bed at four o'clock, at which time he uſually fell into a ſhort ſlumber. In his chamber was found a note written the evening before, betraying throughout the diſtracted ſtate of his mind, but nothing declaratory of his deſign, or that was of any importance.

M. Falk, like all hypochrondriac perſons, was not very communicative, and on certain occaſions was diſtruſtful. But, at the ſame time, he was of a ſedate temper, complaiſant, and upright, which made it a very eaſy matter to bear with him, and ſecure to him the indulgence of all his acquaintance. His extreme ſobriety had enabled him to make ſome ſavings from his pay, though he was very beneficent; it was not, therefore, indigence that drove him to this act of violence. He was of a cold conſtitution, preferring ſolitude and quiet to ſociety, to the company of his friends, and to ordinary amuſements, which yet he did not ſhun, except in the latter period of his life. As to religion, he ſhewed on all occaſions more reſpect for it than any ſtrong effuſions of zeal. It was ſolely to be aſcribed to the violence of his diſtemper, and the weakneſs of mind which it brought on, that led him to put a period to his days. The fate of this unfortunate ſcholar was generally and juſtly lamented.

His papers were found in the greateſt diſorder. They contain, however, very uſeful and important relations. He particularly made it his buſineſs to inquire about the Kirguiſes, and other Tartarian nations, and as he frequently remained for the ſpace of nine months together in the ſame place, he was enabled to procure ſatisfactory notions concerning the objects of his inveſtigations. The Imperial academy, in 1774, appointed Profeſſor Laxmann to arrange his manuſcripts in order for publication; which was done accordingly.

FALLING *Spring*, a branch of James river in Virginia, where it is called Jackſon's river, riſing in the mountain, 20 miles S. W. of the Warm Spring. The water falls over the rock 200 feet, which is about 50 feet higher than the fall of Niagara. Between the ſheet of water and the rock below, a man may walk acroſs dry.—*Morse.*

FALMOUTH, a townſhip, formerly including Portland, in Cumberland co. Maine, containing 2991 inhabitants. It is ſituated on Caſco bay, 120 miles N. N. E. of Boſton. Incorporated in 1718.—*ib.*

FALMOUTH, a townſhip in Hants co. Nova-Scotia; ſituated on the S. E. ſide of the Baſin of Minas, oppoſite Windſor, 28 miles N. W. of Halifax.—*ib.*

FALMOUTH, a maritime townſhip in Barnſtable co. Maſſachuſetts, ſituated on the N. E. part of the Vineyard ſound, on the W. ſide of the bay of its name; 77 miles S. E. by S. of Boſton, 18 from Sandwich, and 9 from Holme's Hole. It was incorporated in 1686, and contains 1637 inhabitants. N. lat. 41. 33. W. long. 70. 35. It is a poſt town.—*ib.*

FALMOUTH, a poſt town in Stafford co. Virginia, ſituated on the N. bank of Rappahannock river, nearly oppoſite to Frederickſburg. It is irregularly built, and contains an Epiſcopalian church and about 150 houſes. It is 23 miles S. W. of Dumfries, 70 N. by E. of Richmond, and 207 S. weſterly of Philadelphia. Conſiderable quantities of tobacco are inſpected here.

FALMOUTH, a town in Lancaſter co. Pennſylvania, ſituated on the S. E. ſide of Conawago creek, 20 miles weſterly of Lancaſter. It has been lately laid out.—*ib.*

FALMOUTH, a town and harbor on the S. ſhore of the iſland of Antigua, in the Weſt-Indies. It has Engliſh harbor on the E. and Rendezvous bay on the W.; and ſituated in St. Paul's pariſh, at the N. W. corner of the harbor, which is well fortified.—*ib.*

FALMOUTH, in the iſland of Jamaica, in the Weſt-Indies, commonly called the Point, is ſituated on the S. ſide of Martha Brae harbor; and including the adjoining villages of Martha Brae and the Rock, is compoſed of 220 houſes. Here 30 capital ſtationed ſhips load for Great-Britain, excluſive of ſloops and ſmaller craft.—*ib.*

FALSINGTON, a village in Pennſylvania, in Bucks co. 28 miles N. E. of Philadelphia.—*ib.*

FAQUIER *Co.* in Virginia, is bounded N. by Loudon and E. by Prince William. It is about 55 miles long and 20 broad, and contains 17,892 inhabitants, of whom 6642 are ſlaves—*ib.*

FAREWELL, CAPE, the S. point of Weſt Greenland, on the N. ſide of the entrance of Davis's ſtraits, North America. N. lat. 59. 37. W. long. 42. 42.—*ib.*

FARMER (Richard D. D.), ſo well known as one of the commentators on Shakeſpeare, was a man of ſuch pleaſing, though ſingular manners, that we regret the very imperfect account which we muſt give of his life. One of us, who had the pleaſure of being a little known to him, has been ſo much delighted with the natural eaſe and pleaſantry of his converſation, that we made all the inquiries which we judged requiſite to enable us to draw up ſuch a biographical ſketch of this agreeable man as might be acceptable to our readers, and not unworthy of his character; but theſe inquiries were made in vain. Thoſe to whom we applied knew little more of the incidents of his life than what we had previouſly found in a miſcellany, of which the writers ſeem to conſider it as a principle of duty to vilify the character of every perſon, who, like Dr Farmer, is the friend of order, and the enemy of ſudden or rapid innovations. To that miſcellany, therefore, we muſt be beholden for many facts; but we ſhall certainly copy none of its malevolence.

Dr Farmer was born at Leiceſter 1735; but what was the ſtation of his father we have not learned. Of his ſchool education he received part, perhaps the whole, in his native town; and from ſchool he was removed to the univerſity of Cambridge, where he devoted himſelf chiefly to claſſical learning and the belles lettres. In 1757, he was admitted to the degree of bachelor of arts; in 1760, to that of maſter of arts; a bachelor of divinity in 1767, and a doctor of divinity in 1775, in which year he was alſo elected maſter of Emanuel on the deceaſe of Dr Richardſon, and principal librarian on the deceaſe of Dr Barnardiſton.

The diſturbances in America having by this time become ſerious, the univerſity of Cambridge, with numberleſs other loyal bodies, voted an addreſs to the king, approving of the meaſures adopted by government to reduce the factious coloniſts to their duty. The addreſs, however, was not carried unanimouſly. It was, of courſe, oppoſed by JEBB, ſo well known for his free opinions in politics and religion, and by ſome others, of whom one man, a member of the CAPUT, carried his oppoſition ſo far, as actually to refuſe the key of the place which contained the ſeal neceſſary on ſuch occaſions. In this emergency, Dr Farmer, who was then vice-chancellor, is ſaid to have forced open the door with a ſledge-hammer; an exploit which his democratical biographers affect to redicule, by calling it *his courtly zeal*, and the occaſion of all his ſubſequent preferments.

If it be indeed true, that he broke the door in pieces with his own hands, his conduct muſt be acknowledged to have been not very decorous; but if the office which he filled be taken into conſideration, we apprehend it would be as difficult to prove that conduct eſſentially wrong, as to vindicate the obſtinate arrogance of him who occaſioned it. The ſeal was the property of the univerſity, of which this outrageous ſupporter of the bill of rights was but an individual member. The univetſity had reſolved that it ſhould be employed for a certain purpoſe, which it was the duty of the vice-chancellor to carry into effect; and ſince the ſeal was refuſed to him, he had no alternative but to get poſſeſſion of it by force. We hope, however, that he employed a ſervant to break the door; and, indeed, as vice-chancellor, he muſt have had ſo many ſervants at his command, that it is not conceivable he would wield the ſledge-hammer himſelf.

Some time after this, he was made a prebendary of Canterbury, we believe through the recommendation of Lord North, then premier; and it was at Canterbury that the writer of this ſketch had the happineſs of being introduced to him, and witneſſing his hoſpitality. After enjoying his prebend for ſeveral years, he reſigned it on being preferred, by the preſent premier, to a reſidentiaryſhip of St Paul's; and we have reaſon to believe, that he declined a biſhopric, which was offered to him as a reward for the conſtitutional principles which he was at pains to propagate, not only in his college, but, as far as his influence went, through the whole univerſity.

It has been ſaid, that the delights of the pipe and the bottle in Emanuel parlour outweighed, in his eſtimation, the dazzling ſplendor of the mitre; but he had other and better reaſons for preferring a private to a public ſtation. In early life, at leaſt before he was advanced in years, he had felt the power of love, and had ſuffered ſuch a diſappointment as ſunk deep in his mind, and for a time threatened his underſtanding. From that period, though he retained his faculties entire, he acquired ſome peculiarities of manner; of which he was ſo far conſcious, as to be ſenſible that they would hardly become the character of a biſhop; being likewiſe ſtrongly attached to dramatic entertainments, which, if we miſtake not, the Engliſh biſhops never witneſs, and delighting in clubs, where he could have rational converſation without ſtate or ceremony of any kind—he very wiſely preferred his reſidentiaryſhip to the higheſt dignity in the church. At the time of his death, which happened in the autumn of 1797, he was a fellow of the Royal and Antiquarian Societies, maſter of Emanuel college, principal librarian of the public library in the univerſity, one of the canons reſidentiary of St Paul's, chancellor of the dioceſe of Lichfield and Coventry, and prebendary of Worceſter.

Though a good claſſical ſcholar, Dr Farmer has been celebrated only for that kind of literature which is connected with the Engliſh drama, and having a ſtrong predilection for old Engliſh writers, he ranked high among the commentators upon Shakeſpeare. His "Eſſay upon the Learning of Shakeſpeare," dedicated to Mr Cradock, the intelligent reſident of Gumley-Hall in Leiceſterſhire, has paſſed through ſeveral editions. This eſſay was, in fact, the firſt foundation of his fame, which an unconquerable indolence prevented him from carrying to that height to which the exerciſe of his literary talents could not have failed to raiſe it. So great indeed was his love of eaſe, that after having announced for ſubſcriptions a hiſtory of Leiceſterſhire, and actually begun to print it, rather than ſubmit to the fatigue of carrying it through the preſs, he retuned the ſubſcriptions, and preſented the MSS. and plates to Mr Nichols, the reſpectable printer of the Gentleman's Magazine, who has ſince carried on the hiſtory with a degree of ſpirit, ability, and induſtry, perhaps unprecedented in this department of literature.

Indolence and the love of eaſe were indeed the Doctor's chief characteriſtics; and to them, with the diſappointment already mentioned, may be attributed a want of propriety in his external appearance, and in the uſual forms of behaviour belonging to his ſtation. The prevailing features of his character diſtinguiſhed themſelves by ſeveral oddities: There were three things, it was ſaid, which the maſter of Emanuel loved, *viz.* old port, old clothes, and old books; and three things which no one could perſuade him to perform, *viz.* to riſe in the morning, to go to bed at night, and to ſettle an account. When in Cambridge, if an old houſe were pulled down, the maſter of Emanuel was always there in an old blue great coat, and a ruſty hat. When in London, he was ſure to be found in the ſame garb at an old book-ſtall, or ſtanding at the corner of a dirty lane, poring through his glaſs at an old play bill.

This character is not drawn by a friendly pencil; but it is nevertheleſs not unjuſt. His inattention to the common decencies of dreſs and behaviour was notorious, inſomuch that, in the company of ſtrangers, the eccentricity of his appearance and of his manners made him ſometimes be taken for a perſon half crazed. The writer of this ſketch ſaw him one morning at Canterbury dreſſed in ſtockings of unbleached thread, brown breeches, and a wig not worth a ſhilling; and when a brother prebendary of his, remarkable for elegance of manners, and propriety of dreſs, put him in mind that they were to attend on the archbiſhop, Dr Farmer replied, that it had totally eſcaped him; but he went home, and dreſſed himſelf like a clergyman. That he ſat late reading, and occaſionally drinking brandy and water, cannot be denied; and it is literally true, that he could not eaſily be prevailed upon to ſettle his accounts. His accounts with ſome of his pupils, when tutor of his college, were never ſettled to the day of his death; and the young gentlemen not unfrequently took advantage of this unconquerable indolence to borrow of him conſiderable ſums, well knowing that there was little chance of a demand being ever made upon their parents. One gentleman, in particular, told a friend of ours, who was himſelf a penſioner of Emanuel, that when he left that college, he was near fifty pounds in debt to Dr Farmer; "a debt (ſaid he) which I would have ſcrupulouſly paid, but, after repeated ſolicitations, I could get no bill from him."

Having been a warm partizan of government during the American war, it will readily be believed that Dr Farmer was the determined enemy of levellers and anarchiſts. He was ſuch a Whig as thoſe who placed King William on the throne; and of courſe deemed a violent Tory by our preſent republicans, of whom, to ſay the truth, he could hardly ſpeak with temper. By his enemies he is admitted to have been a man of generoſity. As he obtained money eaſily, ſo he parted with it eaſily. Whilſt he was always ready to relieve diſtreſs, his bounty was frequently beſtowed on the patronage of learned men and learned publications. He was, accordingly, a favourite with all good men who knew him. In his own college he was adored; in the univerſity he had, for many years, more influence than any other individual; and, with all his eccentricities, his death was a loſs to that learned body, which, in the opinion of ſome of its members, will not ſoon be made up.

FARMINGTON, a very flouriſhing townſhip of excellent land, in Lincoln co. diſtrict of Maine, on Sandy river, 35 miles N. W. of Hallowell, 30 ſame courſe from Harrington, and 204 N. N. E. of Boſton. Number of inhabitants, about 1200. A very few years ſince this townſhip was a wilderneſs.—*Morse.*

Farmington, a large, pleaſant, and wealthy town in Hartford co. Connecticut, 10 miles S. W. of Hartford city, 32 N. E. of New-Haven, and 22 E. of Litchfield. Farmington river, a water of Connecticut, meanders delightfully through charming intervales, which beautify and enrich this town. The houſes, in the compact part of this town, ſtand chiefly on a ſtreet which runs N. and S. along the gentle declivity of a hill, which aſcends E. of the intervales; about the centre of the ſtreet ſtands a large and handſome Congregational church. This town was ſettled as early as 1645, and its limits then were very extenſive. Several towns have been ſince taken from it.—*ib.*

Farmington, a ſmall river of Connecticut, which paſſes through the town of Farmington, where it receives Cambridge or Poquabock river, from the S. W. when it acquires the name of Windſor river and falls into Connecticut river in the town of Windſor, about 4 miles above Hartford city.—*ib.*

FASCINATION, the art of bewitching, enchantment, an unſeen inexplicable influence. Under the title Serpens (*Encycl.* n° 22.) we have mentioned ſeveral inſtances of the faſcinating power of the rattle-ſnake, which were related by men of character, and certainly gained ſome degree of credit among men of ſcience. In Vaillant's New Travels into the Interior Parts of Africa, an account is given of ſimilar inſtances of faſcination by African ſervants, ſome of them witneſſed by himſelf, and others reported to him by men of veracity.

On the confines of the European colony, at a place called *Swart-land*, our traveller ſaw a ſhrike on the branch of a tree, tremble as if in convulſions, whilſt it uttered the moſt piercing cries of diſtreſs. Cloſer attention led him to diſcover upon the next branch of the ſame tree a large ſerpent, that, with ſtretched-out neck, and fiery eyes, though perfectly ſtill, was gazing on the poor animal. He ſhot the ſerpent; but, in the mean-time, the bird had died. Having meaſured the diſtance between the place where the ſhrike was ſeen in convulſions and that occupied by the ſerpent when it was ſhot, he found it to be three feet and a half; which convinced him and his attendants that the bird had not died either from the bite or the poiſon of its enemy. Indeed he ſtripped it before the whole company, and made them obſerve that it was untouched, and had not received the ſlighteſt wound.—In another diſtrict of Africa, during the courſe of the ſame travels, he ſaw a ſmall mouſe die in convulſions, occaſioned by the faſcinating power of a ſerpent, at the diſtance of two yards from it; and when he conſulted his Hottentots upon this incident, they expreſſed, he ſays, no ſort of aſtoniſhment, but aſſured him that the ſerpent had the faculty of attracting and faſcinating ſuch animals as it wiſhed to devour.

We have already had occaſion to remark how regardleſs this author is of inconſiſtencies in his narrative; and we perceive ſomething like an inconſiſtency in the narratives before us. Though his Hottentots expreſſed no ſurpriſe at the faſcination of the mouſe, and declared that nothing was more common, he ſays expreſsly, that to thoſe who witneſſed the faſcination of the ſhrike, the fact appeared ſo extraordinary, that they could hardly believe it, even after they had ſeen it.

The moſt wonderful inſtance of faſcination which we have anywhere met with, was that of a Captain in the Dutch ſervice at the Cape, who, after aſſuring our traveller that it is an event which happens very frequently, proceeded thus: "My teſtimony ought to have the more weight, as I had once nearly become myſelf a victim to this faſcination. While in garriſon at Ceylon, and amuſing myſelf, like you, in hunting in a marſh, I was, in the courſe of my ſport, ſuddenly ſeized with a convulſive and involuntary trembling, different from any thing I had ever experienced, and at the ſame time was ſtrongly attracted, and in ſpite of myſelf, to a particular ſpot of the marſh. Directing my eyes to this ſpot, I beheld, with feelings of horror, a ſerpent of an enormous ſize, whoſe look inſtantly pierced me. Having, however, not yet loſt all power of motion, I embraced the opportunity before it was too late, and ſaluted the reptile with the contents of my fuſee. The report was a taliſman that broke the charm. All at once, as if by a miracle, my convulſion ceaſed ; I felt myſelf able to fly ; and the only inconvenience of this extraordinary adventure was a cold ſweat, which was doubtleſs the effect of my fear, and of the violent agitation my ſenſes had undergone."

This inſtance of faſcination differs in one very material circumſtance from the two ſomewhat ſimilar inſtances mentioned in the *Encyclopædia*. In both theſe, the eyes of the perſons faſcinated were fixed on the eyes of the ſnake; but here the Dutch Captain was ſtrongly attracted towards the ſerpent before he ſaw, or even ſuſpected that ſo formidable an enemy was in his neighbourhood. If the ſtory therefore be true, the effect which he deſcribes could not poſſibly have been the effect of fear, but of ſome unſeen influence on his whole nervous ſyſtem.

The ſubject has of late attracted the attention of men of ſcience, whoſe local ſituation gives them an opportunity of making experiments upon different ſerpents, with a view to aſcertain whether they really poſſeſs or not this moſt unaccountable of all powers. In the year 1796, was printed at Philadelphia, *a Memoir concerning the Faſcinating Faculty which has been aſcribed to the Rattle-ſnake, and other American Serpents*, by Benjamin Smith Barton, M. D. Profeſſor of natural hiſtory and botany in the univerſity of Pennſylvania. In this memoir, the manner in which the faſcinating power is ſuppoſed to be exerted is thus ſtated by the ingenious profeſſor:

" The ſnake, whatever its ſpecies may be, lying at the bottom of the tree or buſh upon which the bird or ſquirrel ſits, fixes its eyes upon the animal it deſigns to faſcinate or enchant. No ſooner is this done, than the unhappy animal is unable to make its eſcape. It now begins to utter a moſt piteous cry, which is well known by thoſe who hear it, and underſtand the whole machinery of the buſineſs, to be the cry of a creature enchanted. If it is a ſquirrel, it runs up the tree for a ſhort diſtance, comes down again, then runs up, and, laſtly, comes lower down. 'On that occaſion (ſays an honeſt, but rather credulous writer*), it has been obſerved, that the ſquirrel always goes down more than it goes up.' The ſnake ſtill continues at the root of the tree, with its eyes fixed on the ſquirrel, with which its attention is ſo entirely taken up, that a perſon accidentally approaching, may make a conſiderable noiſe without the ſnake's ſo much as turning about. The ſquirrel, as before mentioned, comes always lower, and at laſt leaps down to the ſnake, whoſe mouth is already wide open for its reception. The poor little animal then, with a piteous cry, runs into the ſnake's jaws, and is ſwallowed at once, if it be not too big ; but if its ſize will not allow it to be ſwallowed at once, the ſnake liks it ſeveral times with its tongue, and ſmoothens it, and by that means makes it fit for ſwallowing."

Profeſſor Peter Kalm.

From Dr Barton's memoir, it appears that the North American Indians are by no means of one opinion reſpecting the faſcinating power of the rattle-ſnake. Some intelligent friends of his, well acquainted with the manners, religious opinions, and ſuperſtitious prejudices of thoſe people, informed him, that though they had often heard the Indians ſpeak of the ingenuity of theſe reptiles in catching birds, ſquirrels, &c. they did not recollect having ever heard them ſay that ſnakes *charm* birds. On the other hand, however, a Mohegan Indian told the Doctor himſelf, that the Indians are of opinion, that the rattle-ſnake can charm or bewitch, ſquirrels and birds, and that it does this with its rattle, which it ſhakes, thereby inviting the animals to deſcend from the trees, after which they are eaſily caught. According to this Indian, his countrymen do not think that the ſnake, in any manner, accompliſhes the buſineſs with its eyes. A Choktah Indian aſſured the Doctor, that the rattle-ſnake does charm birds, &c.; but he was honeſt enough to confeſs, that he did not know in what manner it does it. The interpreter, through whom the converſation was carried on with this Indian, ſaid that the ſnake charms by means of its rattle.

This opinion of the interpreter was the opinion of Dr Mead. That eminent naturaliſt, controverting, about fifty years ago, the common opinion, that Providence has furniſhed the rattle-ſnake with its rattle to give warning to travellers, was the firſt who aſſerted that this ſingular appendage is given to the animal to terrify ſquirrels and ſmall birds, which are then ſo ſtupified by the ſight of ſo formidable an enemy, that at length they drop down and become its prey ; and that this is what the Indians call *faſcination*. The ſame opinion has been adopted by profeſſor Blumenbach of Gottingen, who, in his Manual of Natural Hiſtory, thus expreſſes himſelf on this curious ſubject :

" That ſquirrels, ſmall birds, &c. fall down ſpontaneouſly from trees into the mouth of the rattle-ſnake, lying below them, is an undiſputed fact ; and is the leſs ſurpriſing, as the like phenomena have been remarked in regard to other ſnakes, and alſo toads, hawks, and cats; all of which, in certain circumſtances, as appears, have the power of drawing towards them ſmall animals, merely by fixing their eyes ſtedfaſtly on them. In regard to the rattle-ſnake, this effect is produced by the rattle in its tail, the hiſſing noiſe of which makes ſquirrels, &c. whether through curioſity, miſtake, or terror, ſeem to approach the animal as it were ſpontaneouſly. At any rate, I know, from the information of intelligent eye-witneſſes, that it is a common ſtratagem of the young ſavages in America to conceal themſelves in the buſhes, where they imitate the hiſſing noiſe of the rattle-ſnake, and by theſe means attract ſquirrels, which they are then enabled to catch."

To this opinion Dr Barton oppoſes an inſuperable objection. It is, that this faſcinating power is by no means peculiar to the rattle ſnake. With regard to the ſtratagem of the ſavages, he thinks that Dr Blumenbach has been impoſed upon ; as neither he, nor any other perſon of whom he made the inquiry, ever heard of ſuch a ſtratagem. The young Indians, he ſays, place a reed croſs-wiſe in their mouth, and by a tremulous motion of the lips, imitate the cry of young birds ; by which means they entice the old ones, ſo that they can eaſily ſhoot them: And this practice may have given riſe to the ſtory of their imitating the hiſſing noiſe of the rattle-ſnake.

Some have ſuppoſed that ſerpents, under certain circumſtances,

cumſtances, emit from their bodies a ſtupifying vapour; and that it is this vapour which produces the effect called *faſcination:* But againſt this opinion Dr Barton alleges the following arguments: "I know, indeed (ſays he), that in ſome of the larger ſpecies of ſerpents, inhabiting South America and other countries, there is evolved in the ſtomach, during the long and tedious proceſs of digeſtion in theſe animals, a vapour or a gas, whoſe odour is intenſely fetid. I have not, however, found that this is the caſe with the rattle-ſnake, and other North-American ſerpents, that I have examined. But my own obſervations on this head have not been very minute. I have made inquiry of ſome perſons (whoſe prejudices againſt the ſerpent tribe are not ſo powerful as my own), who are not afraid to put the heads and necks of the black ſnake, and other ſerpents that are deſtitute of venomous fangs, into their mouths, and have been informed, that they never perceived any diſagreeable ſmell to proceed from the breath of theſe animals. I have been preſent at the opening of a box which contained a number of living ſerpents, and although the box had been ſo cloſe as to admit but a very ſmall quantity of freſh air, although the obſervation was made in a ſmall warm room, I did not perceive any peculiarly diſagreeable effluvium to ariſe from the bodies of theſe animals. I am, moreover, informed by a member of this ſociety*, who has, for a conſiderable time, had a rattle-ſnake under his immediate care, that he has not obſerved that any diſagreeable vapour proceeds from this reptile. On the other hand, however, it is aſſerted by ſome creditable perſons of my acquaintance, that a moſt offenſive odour, ſimilar to that of fleſh in the laſt ſtage of putrefaction, is continually emanating from every part of the rattle-ſnake, and ſome other ſpecies of ſerpents. This odour extends under certain circumſtances, to a conſiderable diſtance from the body of the animal. Mr William Bartram aſſures me, that he has obſerved 'horſes to be ſenſible of, and greatly agitated by it, at the diſtance of forty or fifty yards from the ſnake. They ſhewed (he ſays) their abhorrence by ſnorting, winnowing, and ſtarting from the road, endeavouring to throw their riders, in order to make their eſcape.' This fact, related by a man of rigid veracity, is extremely curious; and, in an eſpecial manner, deſerves the attention of thoſe writers who imagine that this fetid emanation from ſerpents is capable of affecting birds, at ſmall diſtances, with a kind of aſphyxy. It even gives *ſome* colour of probability to the ſtory related by Metrodorus, and preſerved in the Natural Hiſtory of Pliny‡.

Some experiments, however, which were made in Philadelphia a little before the Doctor compoſed his memoir, ſeem to have been deciſive not only as to the fetor, but as to every thing which reſembles faſcination in the rattle-ſnake. Birds which were put into a cage which contained a rattle-ſnake, flew or ran *from* the reptile, as though they were ſenſible of the danger to which they were expoſed. The ſnake made many attempts to catch the birds, but could ſeldom ſucceed. When a dead bird was thrown into the cage, the ſnake devoured it immediately. He ſoon caught and devoured a living mole, an animal much more ſluggiſh than the bird. Dr Barton himſelf ſaw a ſnow-bird (ſee EMBERIZE *Encycl.*) in a cage with a large rattle-ſnake. The little animal had been thus impriſoned for ſeveral hours when he firſt ſaw it, but it exhibited no ſigns of fear. It hopped about from the floor of the cage to its rooſt, and frequently perched on the ſnake's back. Its chirp was nowiſe tremulous, but perfectly natural. It ate the ſeeds which were put into the cage; and by its whole actions moſt evidently demonſtrated that its ſituation was not uneaſy.

Having thus diſpoſed of the doctrines of ſome of his predeceſſors, Dr Barton proceeds to ſay: "The reſult of not a little attention to the ſubject has taught me, that there is but one wonder in the buſineſs;—the wonder that the ſtory ſhould ever have been believed by a man of underſtanding and of obſervation." Faſcination, we are informed, is almoſt entirely limited to birds that build low, and "in almoſt every inſtance, I found that the ſuppoſed faſcinating faculty of the ſerpent was exerted upon the birds at the particular ſeaſon of their laying their eggs, of their hatching, or of their rearing their young, ſtill tender and defenceleſs. I now began to ſuſpect, that the cries and fears of birds ſuppoſed to be faſcinated originated in an endeavour to protect their neſt or young. My inquiries have convinced me that this is the caſe.

The rattle-ſnake, which is the lazieſt of all the ſerpent tribe, never moves in a ſpiral manner or climbs up trees; but the black ſnake, and ſome other ſpecies of the genus coluber, do. When impelled by hunger, and incapable of ſatisfying it by the capture of animals on the ground, they begin to glide up trees or buſhes upon which a bird has its neſt. The bird is not ignorant of the ſerpent's object. She leaves her neſt, whether it contains eggs or young ones, and endeavours to oppoſe the reptile's progreſs. In doing this, ſhe is actuated by the ſtrength of her inſtinctive attachment to her eggs, or of affection to her young. Her cry is melancholy, her motions are tremulous. She expoſes herſelf to the moſt imminent danger. Sometimes ſhe approaches ſo near the reptile that he ſeizes her as his prey. But this is far from being univerſally the caſe. Often ſhe compels the ſerpent to leave the tree, and then returns to her neſt.

It is a well known fact, that among ſome ſpecies of birds, the female, at a certain period, is accuſtomed to compel the young ones to leave the neſt; that is, when the young have acquired ſo much ſtrength that they are no longer entitled to all her care. But they ſtill claim ſome of her care. Their flights are aukward, and ſoon broken by fatigue. They fall to the ground, where they are frequently expoſed to the attacks of the ſerpent, which attempts to devour them. In this ſituation of affairs, the mother will place herſelf upon a branch of a tree or buſh, in the vicinity of the ſerpent. She will dart upon the ſerpent, in order to prevent the deſtruction of her young: but fear, the inſtinct of ſelf preſervation, will compel her to retire. She leaves the ſerpent, however, but for a ſhort time, and then returns again. Oftentimes ſhe prevents the deſtruction of her young, attacking the ſnake with her wings, her beak, or her claws. Should the reptile ſucceed in capturing the young, the mother is expoſed to leſs danger. For, whilſt engaged in ſwallowing them, he has neither inclination nor power to ſeize upon the old one. But the appetite of the ſerpent tribe is great: the capacity of their ſtomachs is not leſs ſo. The danger of the mother is at hand when the young are devoured. The ſnake ſeizes upon her: and this is the caſtrophe, which crowns the tale of faſcination!

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* *American Philoſophical Society.*

‡ *Lib.* 28. *Cap.* 14.

FAVOURABLE *Lake*, in N. lat. 52. 48. W. long. 93. 10. is the ſource of two large rivers, at the mouth of one of which, emptying into Winnipeg lake, ſtands the Canadian houſe. The other is the S. W. branch of Severn river.—*Morse.*

FAUSSE-BRAYE, in fortification, an elevation of earth, about three feet above the level ground, round the foot of the rampart on the outſide, defended by a parapet about four or five fathoms diſtant from the upper parapet, which parts it from the berme and the edge of the ditch. The fauſſe-braye is the ſame with what is otherwiſe called *Chemin des rondes*, and *Baſſe enceinte;* and its uſe is for the defence of the ditch.

FAWN, a townſhip in York co. Pennſylvania.—*Morse.*

FAYETTE, a ſettlement in Tioga co. New-York, between the Unadilla and the main branch of the Chenengo. It is laid out into 100 lots of a ſquare mile each, as nearly as the ground will permit.—*ib.*

FAYETTE, *Co.* in Pennſylvania, is bounded N. by Weſtmoreland, S. by part of Maryland and Virginia, and W. by Monongahela river. It is 39 miles in length and 29 in breadth, and contains 473,280 acres; divided into 11 townſhips, of which Union is the chief. The number of inhabitants is 13,325, of whom 282 are ſlaves.—*ib.*

FAYETTE, a diſtrict of N. Carolina, comprehending 6 counties, viz. Moore, Cumberland, Sampſon, Richmond, Robeſon, and Anſon. It is bounded N. by Hillſborough, S. E. by Wilmington and Newbern, W. by Saliſbury, and S. by the ſtate of S. Carolina. It is 120 miles in length, and 50 in breadth, and contains 34,020 inhabitants, of whom 5,678 are ſlaves.—*ib.*

FAYETTE, a co. of Kentucky, ſurrounded by Clarke, Bourbon, Scott, Franklin, Woodford, Maddiſon, and Mercer counties. Chief town Lexington.—*ib.*

FAYETTEVILLE, ſo called in honor of the Marquis La Fayette, a flouriſhing poſt town of North-Carolina, the ſeat of juſtice for the above diſtrict, and pleaſantly ſituated in Cumberland co. on the W. ſide of the N. W. branch of Cape Fear river, nearly at the head of navigation, and 100 miles above Wilmington, and 61 ſoutherly of Raleigh. On the bank of the river, ſtand a few buildings and the tobacco ware houſes, which have received in one ſeaſon 6000 hhds. of tobacco, equal in quality to that of Peterſburg. The compact part of the town is ſituated about a mile from the river, near the junction af Blount's and Croſs creek; on which laſt it is chiefly erected, and from that circumſtance was formerly named Croſs Creek. On both ſides the creek are about 400 houſes, 2 handſome edifices for the ſupreme, diſtrict, and county courts, and the meetings of the town officers and its citizens. The Free Maſons' lodge is alſo a large and handſome building. The town is regularly laid out, and its principal ſtreets are 100 feet wide. Here are three mills, two conſiderable diſtilleries and breweries, and ſeveral extenſive tan yards. The trade to Wilmington is very conſiderable, to which it ſends down tobacco, wheat, flour, beef, pork, flax-ſeed, hemp, cotton, butter, lumber, ſtaves, naval ſtores, &c. The boats uſed in tranſporting theſe articles to Wilmington, contain about 120 barrels, and make their returns of European and India goods, &c. in from 10 to 20 days. The ſituation of the town is agreeable and healthy, and well adapted for eſtabliſhing manufactories. The country immediately round the town is conſiderably elevated, and the ſoil dry and barren; but near the water courſes, which are numerous, the ſoil is as rich as any in the ſtate. Since the fire in 1792, which deſtroyed many houſes, the people begin to build with brick, which are made here of a good quality, and ſold reaſonably. The town ſtands in a ſettlement of Scotch Highlanders, and is 55 miles N. W. of Camden in S. Carolina, 100 S. W. of Tarborough, 147 S. W. by S. of Halifax, 379 S. by W. of Waſhington city, and 526 S. W. by S. of Philadelphia.—*ib.*

FEAR POINT, CAPE, at the mouth of Cape Fear river in N. Carolina, 4 miles S S. E. of the light-houſe on Bald Head.—*ib.*

FEATHER-EDGED, is a term uſed by workmen for ſuch boards as are thicker on one edge, or ſide, than on the other.

FEDERALSBURG, a village in Maryland, on the E. ſide of Cheſapeak bay, ſituated on Marſhy Hope creek, partly in Dorcheſter and partly in Caroline co. 5 miles E. N. E. of Hunting-Creek town, and about 20 N. E. of Cambridge.—*Morse.*

FE D'ANTIOCHIA, SANTA, the moſt northern town of Popayan, a diſtrict of Terra Firma, S. America. It is ſituated 200 miles N. of Popayan city, near the confines of the province of Carthagena, on the banks of St Martha river, and near 180 miles S. of its conflux with the Magdalena. Thither the inhabitants removed from Antiochia, 15 leagues from it, now an inconſiderable place, whereas Santa Fe d'Antiochia is a conſiderable place, and capital of the audience of Santa Fe.—*ib.*

FE DE BAGOTA, SANTA, the capital of New-Grenada, S. America, ſituated on the banks of the little river Pati, a water of the Magdalena: is 180 miles E. of the bottom of Bonaventura bay. It is an archbiſhop's ſee, and the ſeat of an univerſity founded by king Philip III. in 1610. Near this city are gold mines. The air is temperate and healthful, and proviſions plenty. S. lat. 4. 10. W. long. 74. 5.—*ib.*

FE, or FOY, SANTA, a place in the middle of Veragua, a province in the audience of Guatimala, in North America, where the king of Spain keeps officers for caſting and refining gold. It ſtands at the ſource of a river which runs into the North Sea.—*ib.*

FE, SANTA, the capital of New-Mexico, in N. America. It is ſituated near the ſource of Rio del Nort, 130 leagues from its mouth, in the gulf of Mexico. It is ſaid to be a rich and regularly built city, and a biſhop's ſee. Baudrand makes it 9 leagues from the river. It is alſo called Santa Fe de Grenada: by others New-Mexico. N. lat. 36. W. long. 104.—*ib*

FE, SANTA, a city of Paraguay, S. America, 150 leagues S. by S. W. of the city of Aſſumption. The inhabitants are chiefly employed in huſbandry, grazing, and weaving cloth. They ſell their productions and manufactures to good profit in Brazil. From hence is a road to Potoſi in Peru, and to Corbuda in Tucumana; which being eaſy and convenient, is very advantageous to this place. The diſtance not being above 350 leagues. It ſtands on the W. ſide of Paraguay river. S. lat. 30. 45. W. long. 60 40.—*ib.*

FELTING, the method of working up wool or hair into a kind of cloth or ſtuff, without either ſpinning or weaving it. In this country felting is little practiſed except in hat making; and as nine-tenths of thoſe who are employed in the manufacturing of hats know nothing of the principles on which they proceed, the following obſervations on the mechaniſm of felting muſt to them be both agreeable and uſeful. They are by M. Monge, and taken from the *Annales de Chemie*.

If we examine, in a microſcope, human hair, wool, the hair of a rabbit, hare, beaver, &c. however great the magnifying power of the inſtrument may be, the ſurface of each hair appears perfectly ſmooth and even; or at leaſt, if any inequalities are to be perceived, they ſeem rather to ariſe from ſome difference in the colour and tranſparency of particular parts of theſe ſubſtances than from the irregularity of their ſurfaces; for their image, when viewed by a ſolar microſcope, is terminated by even lines, without any roughneſs. The ſurface of theſe objects, however, is by no means ſmooth; on the contrary, it appears to be formed either of *lamellæ* which cover each other from the root to the point, pretty much in the ſame manner as the ſcales of a fiſh cover the animal from the head to the tail; or, more probably, of zones placed one over the other, like what is obſerved in the ſtructure of horns: to this conformation it is, that the ſubſtances here treated of owe their diſpoſition to what is called felting.

If, with one hand, we take hold of a hair by the root, and draw it between two fingers of the other, from the root towards the point, we are hardly ſenſible of any friction or reſiſtance, nor can we diſtinguiſh any ſound; but if, on the contrary, we hold the hair at the point, and draw it between the fingers, from the point towards the root, we are ſenſible of a reſiſtance which did not exiſt in the former caſe; a ſort of tremulous motion is likewiſe produced which is not only perceptible to the touch, but may alſo be diſtinguiſhed by the ear.

It is evident therefore, that the texture of the ſurface of a hair is not the ſame from the root towards the point as from the point towards the root; and that a hair, when graſped, muſt offer more reſiſtance in ſliding or moving progreſſively towards the point than towards the root; *i. e.* in moving with its point foremoſt

If a hair, after being taken hold of by the fore finger and thumb, be rubbed by them, in the longitudinal direction of the hair, a progreſſive motion takes place, and this motion is always towards the root. This effect does not at all depend on the nature of the ſkin of the fingers or its texture; for if the hair be turned, ſo that the point is placed where the root was, the movement then becomes contrary to what it was before; that is to ſay, it is always directed towards the root.

What is obſerved, in the above inſtance, is entirely analogous to what happens when country children, by way of ſport, introduce an ear of rye or barley between the wriſt and the ſhirt, the points of the beards of which are directed outwards. By the various motions of the arm, this ear, ſometimes catching againſt the ſhirt, ſometimes againſt the ſkin, takes a progreſſive motion backwards, and ſoon gets up to the arm-pit. It is very clear that this effect is produced by the beards of the ear, and indeed chiefly by the aſperities upon thoſe beards; which, being all directed towards the point, do not permit the ear to move in any other direction than towards that part to which it was united to the ſtalk. There is no doubt that it is the ſame with reſpect to hair; and that its ſurface is beſet with aſperities, which, being laid one upon the other, and turned towards the points, permit no motion but towards the root.

A tight knot, made in the middle of a hair, is very difficult to unite by the uſual means, on account of the extreme thinneſs of the hair; but if we place the hair in the bend of the hand, ſo that the knot is in a line with the little finger, and, after graſping the hair by cloſing the hand, we ſtrike the fiſt ſeveral times againſt the knee, the aſperities of one end of the hair being now in a contrary direction to thoſe of the other, each of the ends recedes a little, one of them one way, the other the contrary way; the knot is thereby opened, and, by introducing a pin into the eye which is formed, it is very eaſy to finiſh untying it.

Theſe obſervations, which it would be uſeleſs to multiply, relate to long hair, that having been taken as an example; but they apply with equal propriety to wool, furs, and in general to every kind of animal hair. The ſurface of all theſe is therefore to be conſidered as compoſed of hard *lamellæ* placed one upon another, like tiles, from the root to the point; which *lamellæ* allow the progreſſive motion of the hair towards the root, but prevent a ſimilar motion towards the point.

From what has been ſaid, it is eaſy to explain why the contact of woolen ſtuffs is rough to the ſkin, while that of linen or cotten cloths is ſmooth; the reaſon is, the aſperites upon the ſurface of the fibres of the wool (notwithſtanding the flexibility of each particular fibre), by fixing themſelves in the ſkin, produce a diſagreeable ſenſation, at leaſt till we are accuſtomed to it; whereas the ſurface of the fibres of hemp or flax, of which linen is made, being perfectly ſmooth, do not cauſe any ſuch ſenſation. It is alſo evident, that the injury ariſing to wounds or ſores, from the application of wool, does not proceed from any chemical property, but is occaſioned ſolely by the conformation of the ſurface of the fibres; the aſperities of which attach themſelves to the raw and expoſed fleſh, which they ſtimulate and irritate to ſuch a degree as to produce inflammation.

This conformation is the principal cauſe of that diſpoſition to what is called felting, which the hair of all animals in general poſſeſſes.

The hatter, by ſtriking the wool with the ſtring of his bow (ſee Hat, *Encycl.*), ſeparates the hairs from each other, and cauſes them to ſpring up in the air; the hairs fall again on the table, in all poſſible directions, ſo as to form a layer of a certain thickneſs, and the workman covers them with a cloth, which he preſſes with his hands, moving them backwards and forwards in various directions. This preſſure brings the hairs againſt each other, and multiplies their points of contact; the agitation of them gives to each hair a progreſſive motion towards the root; by means of this motion the hairs are twiſted together, and the *lamellæ* of each hair, by fixing themſelves to thoſe of other hairs which happen to be directed the contrary way, keep the whole in that compact ſtate which the preſſure makes it acquire. In proportion as the maſs becomes compact, the preſſure of the hands ſhould be increaſed; not only to make it more cloſe, but alſo to keep up the progreſſive motion and twiſting of the hairs, which then takes place with greater difficulty: but throughout the whole of this operation, the hairs fix themſelves only to each other, and not to the cloth with which they are covered, the fibres of which, as we have already ſaid, are ſmooth, and have not that diſpoſition to felting which we have deſcribed above.

It may not be amiſs here to explain why that hair which is intended for making hats is always cut off with a ſharp inſtrument (although that cannot be done without loſing a part of its length), and not plucked out by the roots, as might be done after ſoftening the ſkin: the reaſon is, the bulb of the hair, which in the latter caſe would come out with it, would render that end which was fixed in the ſkin thick and obtuſe; and it would conſequently be leſs diſpoſed to introduce itſelf among the contiguous hairs, and to contribute by its progreſſive motion to the contexture of the maſs.

The above deſcribed conformation of the ſurface of hairs and wool is not the only cauſe which produces their diſpoſition to felting. It is not ſufficient that every hair poſſeſſes the forementioned tendency to move progreſſively towards the root, and that the inclined *lamellæ*, by hooking themſelves to each other, preſerve the maſs in that ſtate to which compreſſion has brought it; but it is alſo neceſſary that the hairs ſhould not be ſtraight, like needles; if they were ſo, preſſing and rubbing them together would merely cauſe them to continue their progreſſive motion, without changing their direction: and the effect of thoſe operations would only be to make them move from the centre of the maſs, without producing any compactneſs in it. Every hair muſt therefore be twiſted or curled in ſuch a manner that the extremity which is towards the root may be diſpoſed to change its direction perpetually, to twiſt itſelf about other hairs, and to incline towards itſelf again, in caſe it ſhould be determined thereto by any change in the poſition of the reſt of its length. It is becauſe wool has naturally this crooked form that it is ſo proper for felting, and that it may be made uſe of for that purpoſe without undergoing any previous preparation.

But the hairs of the beaver, the rabbit, the hare, &c. being naturally ſtraight, cannot be employed alone in felting till they have undergone a preliminary operation; which conſiſts in rubbing or combining them, before they are taken off the ſkin, with a bruſh dipped in a ſolution of mercury in aquafortis (nitric acid). This liquor, acting only on one ſide of the ſubſtance of the hairs, changes their direction from a right line, and gives them that diſpoſition to felting which wool naturally poſſeſſes.

When the hairs are not intended to enter into the body of the maſs, but are only to be employed in making a ſort of external coating, ſuch as is ſometimes given to the outer ſurface of hats, the operation juſt mentioned need not be performed; but the felt on which they are to be fixed being finiſhed, the hair is uniformly ſpread upon the ſurface to which the coating is to be applied; and, being covered with a cloth, it is preſſed with the hands, and agitated for a certain time. By theſe means, the hairs introduce themſelves, by the root, a certain depth into the felt, and are there fixed by their *lamellæ* in ſuch a manner as not to be eaſily extracted. A particular direction is afterwards given to them by means of a bruſh, and they are made to keep this direction by having a hot iron paſſed over them. If the agitation were continued for a longer time, theſe hairs, not having their ſtraightneſs deſtroyed by the operation before deſcribed, would paſs entirely through the felt, going out at the oppoſite ſurface, as each hair follows exactly the direction it acquired at the beginning.

It is owing to the very ſame circumſtances which make wool and hair capable of felting, that woollen cloth is thickened by fulling. See FULLING in this Supplement.

FER, POINT AU, on the W. coaſt of lake Champlain, lies in Clinton co. nearly 5 miles S. of the diviſion line between New-York and Lower Canada, and 25 miles S. of St. John's. The Britiſh occupied a barrack here, furniſhed with one field piece, a few men, and a ſubaltern officer. It has been given up according to treaty.—*Morse.*

FERDINAND NARONKA, an iſland on the coaſt of Brazil, South America, lies in S. lat. 3. 56. W. long. 32. 43.—*ib.*

FERGUSSON (Robert), who at an early period of life obtained a conſiderable degree of celebrity as a Scottiſh poet, was born at Edinburgh on the 5th of September 1750, according to a manuſcript account of him with which we have been favoured by a relation. In the biographical ſketch prefixed to the Perth edition of his poems he is ſaid to have been born in 1751.

His father William Ferguſſon poſſeſſed, as well as himſelf, ſome talents for poetry; but, marrying early, and being wiſer than his ſon, he abandoned the muſes for trade, and was employed in different mercantile houſes, firſt in Aberdeen, and afterwards in Edinburgh. At the time of his death, he was an accountant in the Britiſh linen hall, but never acquired any thing like opulence.

During the years of infancy and childhood, the conſtitution of our poet was ſo weak, that little hopes were entertained of his arriving at manhood. By the care, however, and attention of his parents, he gradually acquired ſtrength, and at the age of ſix was put to an Engliſh ſchool, where his proficiency in reading and reciting was uncommonly great. At the age of ſeven he was ſent to the high ſchool of Edinburgh, where he continued four years, and with very little labour made a rapid progreſs in the knowledge of the Latin tongue; but for ſome reaſon or other he was removed from the high ſchool to the grammar ſchool of Dundee, whence, after two years he was ſent to the univerſity of St Andrews. A gentleman of the name of Ferguſſon had left burſaries in that univerſity for the education of two boys of the ſame name; and Mr William Ferguſſon having with difficulty obtained one of them for his ſon, was induced to educate him at St Andrews in preference to Edinburgh.

Though at no period of his life a ſevere ſtudent, our poet's attainments in ſcience were ſuch as to keep alive in the univerſity the hopes which had been formed of him at ſchool; and he was confeſſedly the firſt mathematician of his ſtanding. On this account we are told that he became the favourite of Dr Wilkie, who was then profeſſor of natural philoſophy in the univerſity of St Andrews; but it is not improbable that the Doctor valued him as much for his poetical genius as for his ſkill in geometry ; for Wilkie was a poet himſelf, and Mr Ferguſſon had already written ſeveral ſmall poems which attracted conſiderable notice, as well from the profeſſors as from his fellow-ſtudents. But whatever was the bond of union, Dr Wilkie patroniſed the youthful poet ; and the poet ſhewed afterwards that he was not ungrateful. Upon the Doctor's death, he publiſhed, in the Scottiſh dialect, a beautiful eclogue to his memory, in which the peculiar merits of that eccentric genius are appreciated with great judgment. See Wilkie, in this Supplement.

During the laſt winter that he reſided in St Andrews, our poet had collected materials for a tragedy on the death of Sir William Wallace, and had even completed two acts of the play ; but having ſeen a ſimilar work on the ſame ſubject, he abandoned his deſign ; "becauſe (ſaid he to a friend) whatever I publiſh ſhall be original, and this tragedy might be conſidered as a copy."

Having finiſhed his ſtudies at the univerſity, he returned to Edinburgh without reſolving on any permanent employment. His father had deſigned him for the church ; but he was now dead, and our author turned a deaf ear to the intreaties of his mother, and of every other friend who endeavoured to perſuade him to fulfil his father's intention. He was then adviſed to ſtudy phyſic ; but he declined it, becauſe, he ſaid, that, when reading the deſcription of diſeaſes, he fancied that he felt the ſymptoms of them all in himſelf. To the law, however, he could not ſtart the ſame objection ; and he began to ſtudy it, but made no progreſs. At this his relation and the editor of his poems expreſs no ſurpriſe ; for, according to them, it was a ſtudy the moſt improper for him, as it could not be expected that a genius ſo lively would ſubmit to the drudgery of that dry and ſedentary profeſſion.

That the law was a very improper profeſſion for a man of his narrow fortune is indeed true ; but we truſt that his two biographers will not conſider us as intending any offence to them, if we embrace the preſent opportunity of expoſing the folly of a very common remark, that a lively genius cannot ſubmit to what is abſurdly called a dry ſtudy. We might inſtance different lawyers at our own bar, who, with great poetical talents in their youth, have riſen to the ſummit of their profeſſion ; but to avoid perſonal diſtinctions at home, we ſhall take our examples from England. The genius of the late Earl of Mansfield was at leaſt as lively as that of Mr Ferguſſon, and if he had pleaſed he could have been equally a poet ; yet he ſubmitted to the drudgery of ſtudying a law ſtill drier than that of Scotland. To the fine taſte of Atterbury biſhop of Rocheſter, and to his claſſical compoſitions both in proſe and verſe, no man is a ſtranger who is at all converſant in Engliſh literature: yet that elegant ſcholar and poet, after he had riſen to the dignity of Dean of Carliſle, ſubmitted to the drudgery of ſtudying, through the medium of barbarous Latin, the eccleſiaſtical law of England from the earlieſt ages ; and declared, that by dint of perſeverance he came in time to reliſh it as much as the ſtudy of Homer and Virgil. Whatever be thought of Milton's political principles, no man can read his controverſial writings, and entertain a doubt but that he could have ſubmitted to the drudgery of ſtudying the law.

The truth is, and it is a truth of great importance, that a man of real vigour of mind may bring himſelf to delight in any kind of ſtudy which is uſeful and honourable. Such men were Lord Mansfield, the Biſhop of Rocheſter, and Milton ; but, whether through ſome radical defect in his nervous ſyſtem, or in conſequence of early diſſipation, Mr Ferguſſon, with many eſtimable qualities was ſo utterly deſtitute of this mental vigour, that rather than ſubmit to what his friends call drudgery, he ſeems to have looked with a wiſhful eye to ſome ſinecure place.

With this view he paid a viſit to an uncle who lived near Aberdeen, a man of great learning and in opulent circumſtances, in hopes that, by his intereſt, he might be ſettled in a poſt ſuitable to his merit : But how deluſive were his hopes ! His uncle indeed received him with every mark of affection ; but his fondneſs gradually cooled, and at the end of ſix months, he ordered him abruptly to leave his houſe, without having endeavoured to procure for him any ſettlement.

To a mind like Ferguſſon's, feelingly alive, ſuch treatment from ſo near a relation, to whom he had always behaved with becoming reſpect, muſt have been dreadfully galling. Stung with indignation, he returned to his mother's at Edinburgh ; and as ſoon as he recovered from a ſevere illneſs, brought upon him by diſappointment and the fatigue of his journey, he compoſed two elegies ; one on "The Decay of Friendſhip," and the other "Againſt Repining at Fortune," both occaſioned by his adventure in the North. How much he felt the daſhing of his hopes, is apparent from the following pathetic lines in the Decay of Friendſhip :

But, ah ! theſe youthful ſportive hours are fled,
  Theſe ſcenes of jocund mirth are now no more ;
No healing ſlumbers 'tend my humble bed,
  No friends condole the ſorrows of the poor.

And what avails the thoughts of former joy ?
  What comfort bring they in the adverſe hour ?
Can they the canker-worm of care deſtroy,
  Or brighten fortune's diſcontented lour ?

So deſtitute was he at this period, that he ſubmitted to copy papers in the commiſſary clerk's office, we believe at ſo much the ſheet ; but not liking the employment, and quarrelling with the commiſſary clerk depute, he ſoon left the office in diſguſt.

Hitherto he had lived rather in obſcurity ; and happy had it been for him, if in that obſcurity he had been ſuffered to remain ; happy had it been for him, had his converſation been leſs faſcinating, and his company leſs courted by the frolic and the gay. Poſſeſſing an inexhauſtible fund of wit, the beſt good nature, much modeſty, and great goodneſs of heart, he was viewed with affection by all to whom he was known ; but his powers of ſong, and almoſt unrivalled talents for mimickry, led him oftener into the company of thoſe who wiſhed for him merely to enliven a ſocial hour, than of ſuch as by their virtue were inclined, and by their influence were able, to procure him a competent ſettlement for life. The conſequence of this was great laxity of manners. His moral principles indeed were never corrupted, nor, as we have reaſon to believe, his faith in revelation ſhaken ; but there is no doubt but that, courted as he was by the ſyren voice of pleaſure, he yielded to many temptations, and in the hours of ebriety committed actions which, in his cooler moments, he reflected on with abhorrence.

His conſcience was indeed frequently rouſed. Being on a viſit to a friend at Haddington, and ſauntering one day near the church yard, he was accoſted by a clergyman, who ſeemed to be no ſtranger to the kind of life which he led. This judicious divine contrived to draw his attention to the ſhortneſs of time, the length of eternity, death and judgment, and the awful ſtate that awaits the wicked in an unſeen world; and the converſation made a deep impreſſion on his mind. It ſeemed, however, to be effaced from his memory by the diſſipation of Edinburgh, till it was recalled with double effect by the following accident:

In the room adjoining to that in which he ſlept was a ſtarling, which being ſeized one night by a cat that had found its way down the chimney, awaked Mr Ferguſſon by the moſt alarming ſcreams. Having learned the cauſe of the alarm, he began ſeriouſly to reflect how often he, an immortal and accountable being, had in the hour of intemperance ſet death at defiance, though it was thus terrible in reality even to an unaccountable and ſinleſs creature. This brought to his recollection the converſation of the clergyman, which, aided by the ſolemnity of midnight, wrought his mind up to a pitch of remorſe that almoſt bordered on frantic deſpair. Sleep now forſook his eyelids; and he roſe in the morning, not as he had formerly done, to mix again with the ſocial and the gay, but to be a recluſe from ſociety, and to allow the remembrance of his paſt follies to prey upon his vitals. All his vivacity now forſook him; thoſe lips which were formed to give delight, were cloſed as by the hand of death; and “ on his countenance ſat horror plum'd.”

From this ſtate of gloomy deſpondency, however, he began gradually to recover; and, except that a ſettled melancholy was viſible in his countenance, his health was completely reſtored, when one evening he fell and cut his head ſo dreadfully, that from the loſs of blood he became delirious. In this deplorable ſtate he continued for ſeveral months, till, being quite exhauſted by want of ſleep and conſtant ſpeaking, he expired on the 16th of October 1774. He was interred in the Canongate church yard, where his friends erected a monument to his memory, which has been ſince removed to make way for a larger and more elegant monument by his enthuſiaſtic admirer the late poet Burns.

Thus died Robert Ferguſſon, a young man of the brighteſt genius and of the beſt heart, who, had he joined prudence to his uncommon talents, muſt have riſen to great eminence in the republic of letters; but, as a late juvenile poet has obſerved of him——

Complete alike in head and heart,
But wanting in the prudent part,
He prov'd a poet's lot.

Of his poems no general character can be given. The ſubjects of them are ſometimes uncommon and generally local or temporary. They are of courſe very unequal. But ſuch of them as are in the Scottiſh dialect have been univerſally admired by his countrymen; and when it is conſidered that they were compoſed amidſt a round of diſſipation, they will be allowed to furniſh complete evidence of his genius and his taſte.

FERMANAGH, a townſhip in Mifflin co. Pennſylvania.—*Morse.*

FERMAT (Peter), who was counſellor of the parliament of Toulouſe in France, flouriſhed in the 17th century, and died in 1663. He was a man of great talents, and a very general ſcholar; but being contemporary and intimately connected with Des Cartes, Merſenne, Torricelli, and Huygens, he was naturally led to devote much of his time to the mathematical ſciences. He was (ſays Dr Hutton) a firſt rate mathematician, and poſſeſſed the fineſt taſte for pure and genuine geometry, which he contributed greatly to improve, as well as algebra.

Fermat was author of, 1. A Method for the Quadrature of all ſorts of parabolas.—2. Another on Maximums and Minimums: which ſerves not only for the determination of plane and ſolid problems, but alſo for drawing tangents to curve lines, finding the centres of gravity in ſolids, and the reſolution of queſtions concerning numbers: in ſhort, a method very ſimilar to the fluxions of Newton.—3. An Introduction to Geometric Loci, plane and ſolid.—4. A Treatiſe on Spherical Tangencies: where he demonſtrates in the Solids, the ſame things as Vieta demonſtrated in planes.—5. A Reſtoration of Apollonius's two books on Plane Loci.—6. A General Method for the dimenſion of Curve Lines. Beſides a number of other ſmaller pieces and many letters to learned men; ſeveral of which are to be found in his *Opera Varia Mathematica*, printed at Toulouſe, in folio, 1679.

FERMENTATION is a chemical proceſs which has been already conſidered in the *Encyclopædia*, and will be again reſumed in this *Supplement* under the title *Animal and Vegetable* Substances. In this place we mean nothing more than to give ſuch directions, principally from Mr Richardſon of Hull, for the proper fermentation of malt liquors as have not been fully detailed in the article Brewing (*Encycl.*)

This author controverts, we do not think very ſucceſsfully, the concluſions drawn by Mr Henry from the experiments, of which the reader will find an account in the article Fermentation (*Encycl.*); but it is not his theory with which we are at preſent concerned, but his practice as that of an experienced and enlightened brewer. Having treated of *Worts*, and the proper method of boiling them, for which ſee Wort in this *Supplement*, and having given an hiſtorical view of the proceſs of fermentation, of which a pretty accurate abridgement is inſerted in the articles Brewing and Fermentation (*Encycl.*), he proceeds thus:

“ The agency of air, in the buſineſs of fermentation, is very powerful; but as all fermentable ſubjects have an abundant ſupply, we are rather to provide for the egreſs of their own, than to ſuffer the admiſſion of the external air, by which a great number of the fine, volatile, oleaginous parts of the ſubject would be carried off, and a proportionate injury in flavour and ſpirituoſity ſuſtained. Hence ſuch a covering ſhould be provided for the gyle-tun as would barely allow the eſcape of the common air produced by the operation; whilſt the *gas*, or fixed air, from its greater denſity, reſting upon the ſurface of the beer the whole depth of the curb, prevents the action of the external air, and conſequently the eſcape of thoſe fine and valuable parts juſt mentioned.

“ But towards the concluſion of vinous fermentation, this aerial covering begins to loſe its efficacy ; which points out the neceſſity of then getting the beer into caſks as ſoon as poſſible, that the conſequences may be prevented, of expoſing ſo large a ſurface, liable to ſo copious an evaporation. Amongſt theſe, a loſs of ſpirituoſity is not the leaſt ; for this evaporation is more and more ſpirituous as the action approaches the completion of vinous fermentation ; and that once obtained, the loſs becomes ſtill more conſiderable, if ſtill expoſed to the air ; whence it might be termed the diſtillation of Nature, in which ſhe is ſo much ſuperior to art, that the ethereal ſpirit riſes pure and unmixed, whilſt the higheſt rectification of the ſtill produces at beſt but a compound of aqueous and ſpirituous parts.

“ Nor is this entirely conjecture. Experience teaches us, that we cannot produce ſo ſtrong a beer in ſummer, *ceteris paribus*, as in winter ; the reaſon is, not becauſe the action of fermentation does not realize ſo much ſpirit in warm weather, but becauſe the fermenting liquor, after the perfection of vinoſity, continues ſo long in a ſtate of rarefaction, that the ſpirituous parts are diſſipated in a much greater degree at that time than at any other, in a ſimilar ſtate of progreſſion. And this doctrine of natural diſtillation ſeems to account for that increaſe of ſtrength obtainable from long preſervation, in well cloſed caſks, and, more particularly ſo, in glaſs bottles ; for Nature, in her efforts to bring about her grand purpoſe of reſolving every compound into its firſt principles, keeps up a perpetual internal ſtruggle, as well as an external evaporation ; and if the latter be effectually prevented, the former muſt be productive of additional ſpirituoſity, ſo long as the action keeps within the pale of vinous fermentation.

“ In order to maintain a due regulation of the fermenting power, and to anſwer the ſeveral purpoſes of the operation, a ſcrupulous attention to the degree of heat at which the action commences, and a particular regard to the quality and quantity of the ferment employed, are indiſpenſably neceſſary.” The degree of heat muſt be aſcertained by the thermometer, and regulated by experience : the quantity of yeaſt can be aſcertained only by the intention of the artiſt ; but of the quality of that ſubſtance we ſhall treat under Yeast in this *Supplement*.

FERRISBURGH, a townſhip in Addiſon co. Vermont, on lake Champlain. It contains 481 inhabitants. Otter creek, Little Otter and Lewis's creeks fall into the lake here. The mouth of Otter creek lies in N. lat. 44. 11. 45. W. long. 73. 9. 47.—*Morſe*.

FEZZAN is a kingdom in the interior of Africa, placed in the vaſt wilderneſs as an iſland in the ocean. The following account of it was given to Mr Lucas the African traveller by an old ſhereef, a native of Fezzan ; and that account was confirmed by the governor of Meſurata, who had himſelf viſited Fezzan, and who, having treated the traveller with great kindneſs, ought not to be ſuſpected of having wantonly deceived him.

According to this account, Fezzan is ſituated to the ſouth of Meſurata (ſee Mesurata in this *Suppl.*), and the traveller from the latter place to the former arrives in eight days at Wadan, where refreſhments are procured for the caravan. From thence in five hours they reach the deſart of Soudah, where no vegetable is ſeen to grow but the talk, a tree from which the lemon coloured wood is taken which forms handles for tools. The paſſage of the deſart takes up ſome days, when the traveller finds a miſerable village, producing nothing but dates, brackiſh water, and Indian corn ; from this village a day's journey conducts to the town of Sebbah, where are the remains of an ancient caſtle, and other venerable ruins, and in four days more he reaches Mourzouk, the capital of Fezzan.

This city is ſituated on the banks of a ſmall river, ſurrounded by a high wall for defence, and is diſtant from Meſurata 390 computed miles. Eaſtward of Mourzouk is the town of Queela, in which are the remains of ancient buildings ; the ſize of the ciſterns, and the conſtruction of the vaulted caves, exhibit inſtances of ancient ſplendor. South of which place is Jermah, diſtinguiſhed by numerous and majeſtic ruins, on which are many inſcriptions. Teſſouwa lies eaſtward, near which was a river which the ſhereef remembers, but is now overwhelmed in the moving ſands. N. E. from Mourzouk, diſtant about 120 miles, is the large town of Temmiſwa, where the caravans of pilgrims from Bornou and Nigritia, by way of Cairo to Mecca, provide their ſtores for the deſart.

In the town or province of Mendrah is a large quantity of *trona*, a ſpecies of foſſil alkali, that floats on the ſurface or ſettles on the banks of its ſpreading lakes, great quantity of which is ſent to Tripoli, and ſhipped for Turkey, Tunis, and Morocco : at the latter place it is uſed as an ingredient in the red dye of the leather. Mendrah is about 60 miles ſouth of Fezzan. The territory of Fezzan extends but little weſtward, being confined by barren mountains. The ſmaller towns of this kingdom are ſaid to be about one hundred ; theſe towns are chiefly inhabited by huſbandmen and ſhepherds ; in every town a market is regularly held ; mutton and goat's fleſh are ſold by the quarter, uſually from thirty-two to forty grains of gold, or from four to five ſhillings Engliſh. The fleſh of camels is dearer, and divided into ſmaller parts.

The houſes are of clay, with flat roofs compoſed of branches of trees, on which earth is laid ; this is ſufficient in a climate where it never rains. The heats in ſummer, from April to November, are intenſe, and the hot winds blow from the ſouth-eaſt, ſouth, and ſouth-weſt ; with ſuch violence as to threaten ſuffocation ; when it changes to the weſt or north-weſt a reviving freſhneſs enſues.

The dreſs of the inhabitants is like that of the Moors of Barbary, conſiſting of a large pair of trowſers, a ſhirt which hangs over the trowſers, a kind of waiſtcoat without ſleeves, and a jacket with tight ſleeves ; over the jacket is a looſe robe which reaches below the knee, a girdle of crimſon, and a long cloth called a *barakon* or *alhaicque*, like a highland plaid, is worn ; ſtockings of leather, laced like half boots, and ſlippers ; on the head a red cap and turban ; ſometimes over the whole they throw a long cloak with a hood, called a *burnooſe*. In ſummer they throw off all but the ſhirt and the cap.

The people bear very high degrees of heat, but any cold affects them ſenſibly. Their diſeaſes are chiefly of the inflammatory and putrid kind ; the ſmall pox is common. Their old women are their principal phyſicians. For pains in the head they cup and bleed ; for thoſe in the limbs, they bathe in the hot lakes. They have a multitude of noxious and loathſome animals; the air is crowded with moſquitos, and their perſons are over-run with the vermin which affect the beggars of Europe.

In their perſons they incline to the negro, of a deep ſwarthy complexion, with curly black hair; they are tall, but indolent, inactive, and weak. In their common intercourſe, diſtinction of rank ſeems to be forgotten; rich and poor, maſter and man, converſe, eat, and drink, together; they are, however, generous and hoſpitable.

An extenſive plain compoſes the kingdom of Fezzan: the ſoil is generally a light ſand, the ſprings are abundant, and few regions in Africa exhibit a richer vegetation. The land produces the talk, the white thorn, date trees, the olive and lime, apricot, pomegranate, and fig: Indian corn and barley are the favourite objects of cultivation, of wheat there is little raiſed. The tame animals are, the ſheep, cow, goat, and camel; and the wild are, the oſtrich, antelopes of various kinds, one of which is called the huadee, which when chaſed plunges with addreſs from a precipice, and lights on its hams.

The food of the lower claſs conſiſts of flour of Indian corn, ſeaſoned with oil and fruit; thoſe of ſuperior rank eat wheat bread and fleſh. Fezzan produces much ſalt; the water has in general a mineral taſte, but the favourite beverage is a liquor from the date tree, which acquires, when fermented, an intoxicating ſtrength. In religion they are rigid Mahomedans, but tolerant. Their government monarchical; their preſent king is deſcended from one of the ſhereefs of Taffilet, who about 400 years ſince obtained the crown. Till the preſent century the kingdom was independent, when the Baſhaw of Tripoli conquered and made it tributary; the reigning ſovereign has nearly thrown off this yoke. In Fezzan, the deſcendants of the prophet are highly privileged, their property and perſons are inviolable; they are exempt from certain puniſhments. This claſs are in general either princes or merchants.

The revenue is compoſed of a tax on towns and villages, a tax on every camel load of goods (except proviſions) which enters the capital, fines for offences, lands of perſons dying without heirs, and a tax on gardens and date trees. Gold duſt by weight is the chief medium of payment; but for convenience they are furniſhed with ſmall papers of gold duſt of different values, from two *xarbes* or one and a half upwards; for ſmaller articles corn or flour are uſed as a medium. One grain of gold is equal to 1½d. ſterling. The Fezzan grain is the ſame as in England.

The juſtice of the ſovereign is highly extolled; ſmall offences are puniſhed by the baſtinado, and the puniſhments increaſe to fine, impriſonment, and death. Truſting to their natural defence, their towns are without guard, and they have no ſtanding forces. The only war the ſhereef remembered was undertaken againſt a people inhabiting the mountains of Tibeſti, which is ſeparated from the people of Fezzan by a wide and ſandy deſart. Theſe people are wild and ſavage, and had plundered a caravan belonging to the king, who ſent an army of between 3 and 4000 men againſt and ſubdued them. The country of theſe people produces much ſenna. The vales of Tibeſti are ſaid to be fertile in corn and paſture for cattle, particularly camels. The people live in huts, and profeſs various religions, ſome the Mahomedan, others are attached to their ancient idolatry.

The people of Fezzan carry on a conſiderable trade with Tripoli, Bornou, Nigritia, &c. At the end of October, when the heats are abated, the caravans depart from Mourzouk in ſmall parties of ten or twelve, unleſs in time of war. They lay in proviſions of dates, meal, and mutton ſalted, dried in the ſun, and boiled in oil or fat. The merchants have agents in the chief towns, to whom they ſend the ſlaves they purchaſe. The caravans to Tripoli carry the *trona*, ſenna, gold and ſlaves brought from the ſouthern countries; and in return bring back cutlery, woollen, ſilks, dollars, copper, and braſs.

That to Bornou carries braſs and copper, for the currency of the country, imperial dollars, and various manufactures; but of their own produce only a preparation of dates, and meal of Indian corn, and they take in return ſlaves, gold duſt, and civet.

To Caſhna, an empire in Nigritia, they carry cowries, braſs to make rings and bracelets, horſes, ſeveral kinds of manufactures, and the Gooroo nuts; and in return take gold duſt, ſlaves, cotton cloth, dyed goats ſkins, hides, ſenna, and civet, for the countries ſouth of the Niger, where alſo they convey ſabre blades and Dutch knives, coral, braſs beads, looking glaſſes, dollars, &c. and receive back gold duſt, ſlaves, cotton cloths, goat ſkins, Gooroo nuts, cowries, and ivory.

A caravan of pilgrims ſets out likewiſe in the autumn of every ſecond and third year from Mourzouk, the capital of Fezzan, to Mecca. They proceed to Temeſſa, over the mountain of Ziltan, and thence to Sibbul, a place ſubject to Tripoli; and thence nearly in a line with the Mediterranean ſea to Cairo, and thence to Mecca by the cuſtomary route.

As not one celeſtial obſervation has been taken to determine any latitude between Benin and Tripoli, all the poſitions are fixed by eſtimation, reckoning fifteen or ſixteen miles for a day's journey. Mr Rennell places Mourzouk, the capital of Fezzan, in lat. 27°. 20′, or 260 miles from Maſurata.

FIDLERS *Elbow*, a bend of Wood creek, between the outlet of South bay and the mouth of the creek, at the northern end of lake Champlain, oppoſite the mouth of Eaſt bay. The mouth of Wood creek lies in N. lat. 43. 32. W. long. 73. 15. 12.—*Morse.*

FIGURATE NUMBERS are ſuch as do or may repreſent ſome geometrical figure, ſuch as a triangle, pentagon, or pyramid, &c. Theſe numbers are treated of at great length by Maclaurin in his Fluxions; Simpſon in his Algebra; and Malcolm in his Arithmetic; but the following account of them by Dr Hutton is as perſpicuous as any that we have ſeen:

Figurate numbers are diſtinguiſhed into orders, according to their place in the ſcale of their generation, being all produced one from another, viz. by adding continually the terms of any one, the ſucceſſive ſums are the terms of the next order, beginning from the firſt order, which is that of equal units 1, 1, 1, 1, &c.; then the 2d order conſiſts of the ſucceſſive ſums of thoſe of the 1ſt order, forming the arithmetical progreſſion 1, 2, 3, 4, &c.; thoſe of the 3d order are the ſucceſſive ſums of thoſe of the 2d, and are the triangular numbers 1, 3, 6, 10, 15, &c.; thoſe of the 4th order are

Figurate Numbers.

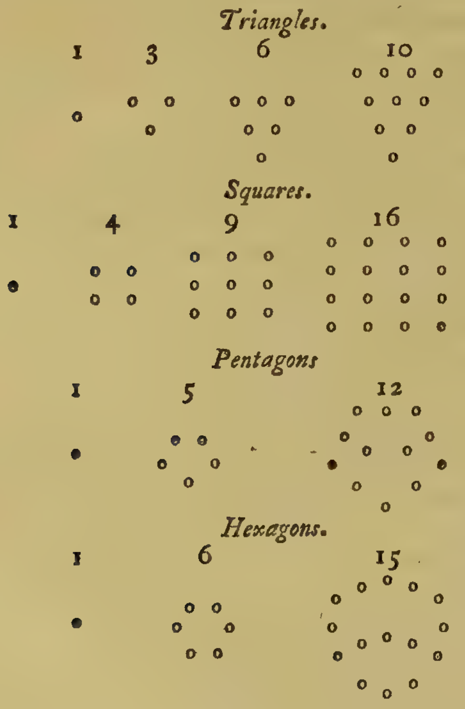
the ſucceſſive ſums of thoſe of the 3d, and are the pyramidal numbers 1, 4, 10, 20, 35, &c.; and ſo on, as below:

Order.	*Name.*	*Numbers.*					
1.	Equals,	1,	1,	1,	1,	1,	&c.
2.	Arithmeticals,	1,	2,	3,	4,	5,	&c.
3.	Triangulars,	1,	3,	6,	10,	15,	&c.
4.	Pyramidals,	1,	4,	10,	20,	35,	&c.
5.	2d Pyramidals,	1,	5,	15,	35,	70,	&c.
6.	3d Pyramidals,	1,	6,	21,	56,	126,	&c.
7.	4th Pyramidals,	1,	7,	28,	84,	210,	&c.

The above are all conſidered as different ſorts of triangular numbers, being formed from an arithmetical progreſſion whoſe common difference is 1. But if that common difference be 2, the ſucceſſive ſums will be the ſeries of ſquare numbers: if it be 3, the ſeries will be pentagonal numbers, or pentagons; if it be 4, the ſeries will be hexagonal numbers, or hexagons; and ſo on. Thus:

Arithmeticals.	1ſt *Sums*, or *Polygons.*	2d *Sums*, or 2d *Polygons.*
1, 2, 3, 4,	Tri. 1, 3, 6, 10	1, 4, 10, 20
1, 3, 5, 7,	Sqrs. 1, 4, 9, 16	1, 5, 14, 30
1, 4, 7, 10,	Pent. 1, 5, 12, 22	1, 6, 18, 40
1, 5, 9, 13,	Hex. 1, 6, 15, 28	1, 7, 22, 50
&c.		

And the reaſon of the names triangles, ſquares, pentagons, hexagons, &c. is, that thoſe numbers may be placed in the form of theſe regular figures or polygons, as here below:



But the figurate numbers of any order may alſo be found without computing thoſe of the preceding orders; which is done by taking the ſucceſſive products of as many of the terms of the arithmeticals 1, 2, 3, 4, 5, &c. in their natural order, as there are units in the number which denominates the order of figurates required, and dividing thoſe products always by the firſt product. Thus the triangular numbers are found by dividing the products 1 × 2, 2 × 3, 3 × 4, 4 × 5, &c. each by the firſt prod. 1 × 2; the firſt pyramids by dividing the products 1 × 2 × 3, 2 × 3 × 4, 3 × 4 × 5, &c. by the firſt 1 × 2 × 3. And, in general, the figurate numbers of any order *n*, are found by ſubſtituting ſucceſſively 1, 2, 3, 4, 5, &c. inſtead of *x* in this general expreſſion $\frac{x . x+1 . x+2 . x+3 . \&c.}{1 . 2 . 3 . 4 . \&c.}$; where the factors in the numerator and denominator are ſuppoſed to be multiplied together, and to be continued till the number in each be leſs by 1 than that which expreſſes the order of the figurates required.

Filter.

FILTER (See *Encycl.*). It is well known that veſſels made of a particular kind of porous ſtone are employed as filtering baſins for freeing water, intended to be drunk, from various kinds of impurity. In ſea voyages ſuch filtering baſins muſt be highly uſeful; and they are frequently found uſeful at land where no water can be had but from ſtagnant pools, or ſprings flowing through clay. The ſtone, however, of which they are made is not every where to be found; and therefore different perſons have endeavoured to employ the art of the potter to ſupply their place.

In the year 1790 a patent was granted to a female potter, for her invention of the following compoſition for this purpoſe; viz. four equal parts, out of nine equal parts, of tobacco-pipe clay; and five equal parts, out of nine equal parts, of coarſe ſea, river, drift, or pit ſand; theſe two materials, in the above proportions, are ſufficient for the purpoſe of making ſmall baſins, and other veſſels, to contain a quantity not exceeding one gallon of water, or other liquid. But the compoſition, when confined to theſe two materials, and in theſe proportions, often flies or cracks in the fire, if larger baſins, or other veſſels, are attempted to be made with it. She, therefore, in the ſecond inſtance, compoſes her filtering baſins of equal parts of tobacco-pipe clay and coarſe ſea, river, drift, or pit ſand; in the third inſtance, of three equal parts, out of nine equal parts, of tobacco-pipe clay; one equal part, out of nine equal parts, of Stourbridge clay, or clay from the ſurface of coal-mines, or any other clay of the ſame quality; one equal part, out of nine equal parts, of Windſor, or other loam, of the ſame quality with Windſor loam; and four equal parts, out of nine equal parts, of coarſe river, ſea, drift, or pit ſand. Or, in the fourth inſtance, of four equal parts, out of eight equal parts, of tobacco-pipe clay; three equal parts, out of eight equal parts, of coarſe ſea, river, drift, or pit ſand; and one equal part, out of eight equal parts, of that burnt ground clay of which crucibles are made.

If the lady who invented, or pretends to have invented, theſe baſins, have a right to her patent, far be it from us to wiſh our readers of any deſcription to incroach upon it; but as the uſe of the materials of which her baſins are made was known to potters before ſhe was born, they may certainly compound theſe materials in proportions different from hers, without doing her any legal injury. As ſhe varies her own proportions ſo much, we think it probable that ſome proportion differing a little from them all, may anſwer the purpoſe of filtering veſſels equally well; and it is almoſt needleſs to add, that with this precaution any potter may make ſuch veſſels, for which he would undoubtedly have a great demand.

A patent has likewiſe been granted to Mr Joſhua Collier of Southwark for a very ingenious contrivance for filtering and ſweetening water, oil, and all other liquids. Of this contrivance, which combines the application of machinery with the antiſeptic properties of charcoal (See Chemistry N° 34. *Supplement*), we ſhall give a detailed account.

Fiſh oil is one of the liquids which he had it particularly in view to free from all its impurities in ſmell, taſte, and colour; and the chemical proceſs employed by him for this purpoſe conſiſts in pouring a quantity of any ſpecies of fiſh oil, or a mixture of different ſorts of fiſh oil, into any convenient veſſel, which is to be heated to the temperature of 110 or 120 degrees of Fahrenheit's ſcale, and then adding of cauſtic mineral alkali, of the ſpecific gravity commonly deſcribed as 1.25, or of ſuch ſtrength that a phial containing 1000 grains of diſtilled water will contain 1250 grains of theſe lees, a quantity equal to four parts of the 100 by weight of the quantity of oil; the mixture is then to be agitated, and left to ſtand a ſufficient time for the ſalts and ſediments to ſubſide; it is then drawn off into another veſſel, containing a ſufficient quantity of freſh burnt charcoal, finely powdered, or any other ſubſtance poſſeſſing antiſeptic properties, in a powdered or divided ſtate, with an addition of a ſmall proportion of diluted ſulphuric acid, ſufficient only to decompoſe the ſmall quantity of ſaponaceous matter ſtill ſuſpended in the oil, which appears by the oil becoming clear at the ſurface: the contents of this veſſel are alſo agitated, and the coaly ſaline and aqueous particles left to ſubſide; after which the oil is paſſed through proper ſtrainers, herein after deſcribed, and is thereby rendered perfectly tranſparent and fit for uſe.

The principle of the improved ſtrainers, or filtering machines, conſiſts in the means applied to combine hydroſtatic preſſure, which increaſes according to the perpendicular height of the fluid, with the mode of filtering *per aſcenſum*, thereby procuring the new and peculiar advantage that the fluid and its ſediment take oppoſite directions. A great advantage attending this invention is, that the dimenſions of the chamber in which the ſediment is received, may be varied, while the filtering ſurface remains the ſame. To adapt the machines not only to the purpoſe of familes, work-houſes, hoſpitals, public charities, the navy, or the merchant ſervice, but alſo to all the purpoſes of oil-men, of diſtillers, of the laboratory, the brewery, &c. chambers of various capacities muſt be provided for the ſediment and precipitated matter. With reſpect to the oil-trade, the ſpace required is very great, eſpecially for ſpermaceti, or Braſil bottoms. In the various purpoſes of the laboratory, no limits can be fixed, but all dimenſions will be occaſionally required: in diſtilleries and breweries they may be ſmaller in proportion; and in that deſigned for water and for domeſtic uſe, a very ſmall chamber will be ſufficient. When water is to be ſweetened, or freed from any putrid or noxious particles, it paſſes, in its way to the filtering chamber, through an iron-box, or cylinder, containing charcoal finely powdered, or any other antiſeptic ſubſtance inſoluble in water, the water being forced into it by hydroſtatic preſſure, through a tube of any ſufficient height. This box has two apertures to receive and deliver the fluid, and theſe are opened and cloſed by cocks, or ſcrews, or any other method uſed for ſuch purpoſes, and being affixed to the machine by other ſcrews, may be eaſily detached from the ſame. Thus, whenever the charcoal begins to loſe its antiſeptic properties, the box is removed and heated till it is red hot; by which means the foreign matter eſcapes through the ſmall apertures, after which the box is cooled, and the charcoal becomes ſweet, pure, and equally fit for uſe as at firſt, though the proceſs be ever ſo often repeated.

Another part of the invention conſiſts in filtering machines in the form of ſtills, in which charcoal may be repeatedly burned after any fluid ſubſtances have paſſed through it, for the purpoſe of freeing them either from putrid or noxious particles, or of diſcharging their colouring matter; which filtering ſtills are ſo contrived, that the fluid may paſs through in any quantity, without diſplacing the charcoal: the part of the fluid remaining interſperſed among the charcoal, may be driven over by heat, and be employed for many inferior purpoſes of the arts or manufactures. Laſtly, the heat may be raiſed ſo as to purify the charcoal, as has been before deſcribed in the machines for water. The flue of thoſe ſtills is ſo conſtructed that water may be employed to cool them without the loſs of time requiſite for their gradually parting with their heat to the ſurrounding atmoſphere, ſo as to be fit for a ſubſequent operation.

But it was not merely to the purifying of oils and various liquids that Mr Collier turned his attention. To his filtering apparatus are attached inſtruments for aſcertaining the comparative qualities of oils, which depend in part on the principle of their ſpecific gravities; ſpermaceti oil, contraſted with other fiſh oils, being as 875 to 920. For this purpoſe, a glaſs veſſel of any convenient ſhape, is made uſe of, furniſhed with a bubble alſo of glaſs, and a thermometer. If the oil is pure, this bubble ſinks, when the mercury riſes to a certain ſtandard, by the application of the hand, or any other heat to the veſſel containing the oil. If the ſpermaceti oil is impure, the bubble will ſtill float, though it is of the temperature required; and the degree of impure, or foreign matter, will be ſhewn by the ſtate of the thermometer at which the bubble ſinks.

To determine what tendency oils uſed for burning have to congeal in cold weather, a freezing mixture is put in a phial of thin glaſs, or any other convenient veſſel; into this a thermometer is immerſed, and a ſingle drop of the oil, under experiment, ſuffered to fall on the outſide of the veſſel, where it immediately congeals; as the cold produced by the mixture gradually ceaſes, it is eaſy to obſerve by the thermometer at what point of temperature the oil becomes fluid, and runs down the ſide of the glaſs.

Plate XXIII.

A ſhort deſcription of this apparatus will make its principles plain to every reader. A (fig. 1.) is the ciſtern, into which the water or other liquor to be filtered is put. B B is a tube opening into the bottom of the ciſtern A, and bent along the bottom of the machine conveying the fluid into C C C the filtering chamber which is covered with leather bound down round its circular rim, and through which leather the water is percolated. D D, The baſon riſing above the level of the chamber and receiving the filtered liquor. E, The ſpout by which it runs off into a pitcher or other veſſel. F, Another ſpout furniſhed with a cock to draw off the foul water from the chamber when neceſſary. G G G, The air tube, which begins above the level of the chamber, is covered with a button, which ſaves the leather from being cut, and has a ſmall lateral aperture for the air to be carried off. This pipe paſſes along the bottom and up the ſide, and riſing above the level of the water in the ciſtern, is there cloſed, except a ſmall lateral aperture through which the air eſcapes. H, A guard or rim with croſs bars put over the leather to keep it from being forced up by the water. It is faſtened down by means of two notches on oppoſite ſides of the guard, by which it locks into two ſtaples rivetted into the bottom of the baſon. I, the lid ſliding down to cover the water from duſt, and ſuſpended at pleaſure by means of K K, two ſprings on each tube for that purpoſe. L M N O, A cylindrical box containing charcoal, which is connected with the above by means of the tube P, and a continuation of the tube B. I, M, The water tube B continued below the charcoal apparatus, ſo that the fluid may paſs through the ſame into the cylinder, from whence it enters the chambers at P, ſo as to be filtered through the leather as before deſcribed. R R, Collars which may be unſcrewed at pleaſure, ſo as to detach the charcoal apparatus whenever the charcoal requires to be purified by heat. S S, Two cocks to direct the fluid through the charcoal cylinder or immediately into the filtering chamber.

Fig. 2. A, A tub or ciſtern, containing the oil to be filtered, and ſupplying a tube of ſufficient height for the hydroſtatic preſſure to operate. B B, A main tube of wood, tin, leather, or cloth, to which any number of bags, of the ſize and ſhape of corn ſacks, or any C C convenient ſize or ſhape may be connected. Theſe are bound to D D D, ſtraight double iron bars, furniſhed with a hinge at one end and a ſcrew at the other, by opening which the bags may be emptied. F, A trough underneath, made to receive the filtered oil from the receivers E E E.

Fig. 3. A, A funnel caſk or ciſtern, into which the fluid is put which paſſes down. B, A tube fitted into the ſame, through which it enters. C, An iron ſtill, or ſtill of any other ſubſtance capable of ſuſtaining heat, full of finely powdered and ſifted charcoal, through the head of which the fluid paſſes into any receiver. D, A fire place of any conſtruction to drive over the fluid remaining interſperſed among the charcoal, and alſo to purify the charcoal by an increaſe of temperature when required. E, A cock to let water into the flues to cool the apparatus for a ſubſequent operation.

Fig. 4. The trial glaſs with its thermometer.

FINCASTLE, a poſt town in Virginia, and capital of Botetourt co. ſituated on the E. ſide of Catabaw creek, a ſmall ſtream which falls into James river, on the W. ſide of the North Mountain. Here are about 50 houſes, a court-houſe and gaol. It lies on the poſt road from Richmond to Kentucky, 36 miles eaſterly of Lexington, and 192 W. by N. of Richmond.—*Morſe.*

FINDLEY, a townſhip in Waſhington co. Pennſylvania.—*ib.*

FIRE. See that article *Encycl.* and Caloric and Combustion, *Chemistry-Index* in this *Suppl.*

Extinction of FIRE is ſometimes a matter of ſo much conſequence, that every thing which promiſes to be effectual for that purpoſe is worthy of attention. In the nineteenth number of Mr Nicholſon's Journal of Philoſophy, Chemiſtry, and the Arts, we have the following compoſition for extinguiſhing fire, invented by M. Von Aken.

Burnt Alum	pounds	30
Green vitriol powdered		40
Cinabreſe or red ochre in powder		20
Potter's clay, or other clay, alſo powdered		200
Water,		630

With 40 meaſures of this mixture an artificial fire was extinguiſhed under the direction of the inventor by three perſons, which would have required the labour of 20 men, and 1500 meaſures of common water. Sig. Fabbroni was commiſſioned to examine the value of this invention, and found, in his comparative trials with engines of equal power, worked by the ſame number of men, that the mixture extinguiſhed the materials in combuſtion in one ſixth part leſs time, and three eighths leſs of fluid than when common water was uſed. He obſerved, as might indeed have been imagined from the nature of the material, that the flame diſappeared wherever the mixture fell, and that the ſaline, metallic, and earthy matters formed an impenetrable lute round the hot combuſtible matter, which prevented the acceſs of the air, and conſequently the renewal of the deſtructive proceſs.

This recipe, Mr Nicholſon informs us, is taken from the 85th N° of the Giornale Letterario di Napoli, in which it was inſerted in the form of a letter from Sig. Fabbroni to Sig. D. Luigi Targioni of Naples; and the author of the letter eſtimates the price of the compoſition at about one halfpenny per pound.

The reaſon aſſigned by Mr Nicholſon for giving this abridged account a place in his valuable work, will be admitted by him and the public as a ſufficient reaſon for our adopting it into our's. It is, that ſuch inventions are worthy of the attention of philoſophers and economiſts, even though in the firſt applications they may prove leſs advantageous than their inventors may be diſpoſed to think. It is ſcarcely probable that this practice in the large way, with an engine throwing upwards of 200 gallons (value about L. 3, 10s) each minute, would be thought of or adopted, or that a ſufficient ſtore of the materials would be kept in readineſs; ſince at this rate the expenditure for an hour would demand proviſion to the amount of L. 210 ſterling. But in country places the proceſs, or ſome variation of it, might be applied with ſufficient profit in the reſult, more eſpecially if it be conſidered that common ſalt or alum, or ſuch ſaline matter as can be had and mixed with the water, together with clay, chalk, or lime, ochreous earth or common mud, or even theſe laſt without any ſalt, may anſwer the purpoſe of the lute with more or leſs effect, and extinguiſh an accidental fire with much greater ſpeed and certainty than clear water would do.

Fire-Balls are meteors, of which ſome account has been given in the *Encyclopædia*, as well as of various hypotheſes which have been framed reſpecting their nature and their origin. Since that article was publiſhed, a new and very ſingular hypotheſis has been framed by Profeſſor Chladni of Wittenberg, who maintains it by arguments, which, however fanciful, are yet worthy of the reader's notice.*

He ſuppoſes, that fire-balls, inſtead of being collections of the electrical fluid floating in the higheſt regions of our atmoſphere, are maſſes of very denſe matter formed in far diſtant parts of ſpace, and ſubjected to ſimilar laws with the planets and comets. He endeavours to prove, that their component parts muſt be denſe and heavy; becauſe their courſe ſhews, in ſo apparent a manner, the effects of gravity; and becauſe their maſs, though it diſtends to a monſtrous ſize, retains ſufficient conſiſtency and weight to continue an exceedingly rapid movement through a very large ſpace, without being decompoſed or diſſolved, notwithſtanding the reſiſtance of the atmoſphere. It ſeems to him probable, that this ſubſtance is by the effect of fire reduced to a tough fluid condition; becauſe its form appears ſometimes round and ſometimes elongated, and as its extending till it burſts, as well as the burſting itſelf, allows us to ſuppoſe a previous capability of extenſion by elaſtic fluidity. At any rate it appears to be certain, that ſuch denſe matter, at ſo great a height is not collected from particles to be found in our atmoſphere, or can be thrown together into large maſſes by any power with which we are acquainted; that no power with which we are acquainted is able to give to ſuch bodies ſo rapid a projectile force in a direction almoſt parallel to the horizon; that the matter does not riſe upwards from the earth, but exiſts previouſly in the celeſtial regions, and muſt have been conveyed thence to our earth. In the opinion of Dr Chladni, the following is the only theory of this phenomenon that agrees with all the accounts hitherto given, which is not contrary to nature in any other reſpect, and which beſides ſeems to be confirmed by various maſſes found on the ſpot where fire-balls fell.

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* *Phil. Mag.* nos. 5 and 7.

As earthy, metallic, and other particles form the principal component parts of our planets, among which iron is the prevailing part, other planetary bodies may therefore conſiſt of ſimilar, or perhaps the ſame component parts, though combined and modified in a very different manner. There may alſo be denſe matters accumulated in ſmaller maſſes, without being in immediate connection with the larger planetary bodies diſperſed throughout infinite ſpace; and which, being impelled either by ſome projecting power or attraction, continue to move until they approach the earth or ſome other body, when, being overcome by its attractive force, they immediately fall down. By their exceedingly great velocity, ſtill increaſed by the attraction of the earth and the violent friction in the atmoſphere, a ſtrong electricity and heat muſt neceſſarily be excited; by which means they are reduced to a flaming and melted condition, and great quantities of vapour and different kinds of gaſes are thus diſengaged, which diſtend the liquid maſs to a monſtrous ſize, till, by a ſtill farther expanſion of theſe elaſtic fluids, it muſt at length burſt. Dr Chladni thinks alſo that the greater part of the *ſhooting ſtars*, as they are called, are nothing elſe than fire-balls, which differ only from the latter in this, that their peculiarly great velocity carries them paſt the earth at a greater diſtance, ſo that they are not ſo ſtrongly attracted by it as to fall down; and therefore, in their paſſage through the high regions of the atmoſphere, occaſion only a tranſient electric flaſh, or actually take fire for a moment, and are again ſpeedily extinguiſhed, when they get to ſuch a diſtance from the earth that the air becomes too much rarefied for the exiſtence of fire.

The grounds on which Dr Chladni ſupports this opinion are various relations, well authenticated, of the motions of thoſe meteors, and the phenomena which accompany their burſting. Beſides thoſe mentioned in the *Encyclopædia*, he lays a particular ſtreſs on the account which he received from *M. Baudin*, Profeſſor of philoſophy at Pau, of a remarkable fiery meteor ſeen in Gaſcony on the 24th of July, 1790. On the evening of that day M. Baudin was in the court of the caſtle of Mormes with a friend, the atmoſphere being perfectly clear, when they ſuddenly found themſelves ſurrounded by a whitiſh light, which obſcured that of the full moon, then ſhining with great luſtre. On looking upwards, they obſerved, almoſt in their zenith, a fire-ball of a larger diameter than the moon, and with a tail equal in length to five or ſix times the diameter of the body. The ball and the tail were of a pale white colour, except the point of the latter, which was almoſt as red as blood. The direction of this meteor was from ſouth to north.

"Scarcely (ſays M. Baudin) had we looked at it for two ſeconds, when it divided itſelf into ſeveral portions of conſiderable ſize, which we ſaw fall in different directions, and almoſt with the ſame appearance as the burſting of a bomb. All theſe different fragments became extinguiſhed in the air, and ſome of them, in falling, aſſumed that blood-red colour which I had obſerved in the point of the tail. It is not improbable that all the reſt may have aſſumed the ſame colour; but I remarked only thoſe which proceeded in a direction towards Mormes, and which were particularly expoſed to my view.

"About two minutes and a half, or three minutes after, we heard a dreadful clap of thunder, or rather exploſion, as if ſeveral large pieces of ordnance had been fired off together. The concuſſion of the atmoſphere by this ſhock was ſo great, that we all thought an earthquake had taken place. The windows ſhook in their frames, and ſome of them, which probably were laid to, and not cloſely ſhut, were thrown open. We were informed next day, that in ſome of the houſes at Houga, a ſmall town about half a mile diſtant from Mormes, the kitchen utenſils were thrown from the ſhelves; ſo that the people concluded there had been an earthquake. But as no movement was obſerved in the ground below our feet, I am inclined to think that all theſe effects were produced merely by the violent concuſſion of the atmoſphere.

"We proceeded into the garden while the noiſe ſtill continued and appeared to be in a perpendicular direction above us. Sometime after, when it had ceaſed, we heard a hollow noiſe, which ſeemed to roll along the chain of the Pyrenees in echoes, for the diſtance of fifteen miles. It continued about four minutes, becoming gradually more remote, and always weaker; and at the ſame time we perceived a ſtrong ſmell of ſulphur.

"While we were endeavouring to point out to ſome perſons preſent the place where the meteor had divided itſelf, we obſerved a ſmall whitiſh cloud, which aroſe perhaps from the vapour of it, and which concealed from us the three ſtars of the Great Bear, lying in the middle of thoſe forming the ſemicircle. With ſome difficulty, however, we could at laſt diſtinguiſh theſe ſtars again behind the thin cloud. There aroſe, at the ſame time, a freſh gentle breeze.

“ From the time that elapſed between the burſting of the ball, and the exploſion which followed, I was inclined to think, that the meteor was at the height of at leaſt ſeven or eight miles, and that it fell four miles to the north of Mormes. The latter part of my conjecture was ſoon confirmed by an account which we received, that a great many ſtones had fallen from the atmoſphere at Juliac, and in the neighbourhood of Barbotan. One of theſe places lies at the diſtance of about four miles to the north of Mormes, and the other at about the diſtance of five to the north-north-weſt.”

M. de Carrits Barbotan, the friend who was with the Profeſſor in the court and garden of Mormes when the meteor firſt attracted their attention, was at Juliac two days afterwards, and confirmed to him the truth of this circumſtance. It appeared, likewiſe from the account of ſeveral intelligent perſons, highly worthy of credit, that the meteor burſt at a little diſtance from Juliac, and that the ſtones which fell were found lying in a ſpace almoſt circular, about two miles in diameter. They were of various ſizes. Some were *ſeen to fall*, which, when found, weighed 18 or 20 pounds, and which had ſunk into the earth from two to three feet. M. de C. Barbotan tranſmitted one weighing 18 pounds to the academy of ſciences at Paris; and M. Baudin was told, that ſome were found which weighed even 50 pounds. He examined a ſmall one, and found it very heavy in proportion to its ſize: it was black on the outſide; of a greyiſh colour in the inſide, and interſperſed with a number of ſmall ſhining metallic particles. On ſtriking it with a piece of ſteel, it produced a few ſmall dark red ſparks, not very lively. A mineralogiſt, to whom a like piece of ſtone from the ſame meteor was ſhewn at Paris, deſcribed it as a kind of grey ſlag mixed with calcareous ſpar, the ſurface of which exhibited vitrified blackiſh calx of iron. The Profeſſor was told alſo, that ſome ſtones were found totally vitrified.

Such (ſays Dr Chladni) is the account given by Baudin of this meteor; the phenomena of which he endeavours to explain from accumulations in the upper parts of the atmoſphere.

According to all the obſervations hitherto made with any accuracy on fire-balls, the height at which they were firſt perceived was always very conſiderable, and by comparing the angles under which they were ſeen from different points, often 19 German miles, and even more; their velocity, for the moſt part, ſeveral miles in a ſecond; and their ſize always very great, often a quarter of a mile, and even more, in diameter. They were all ſeen to fall moſtly in an oblique direction; not one of them ever proceeded upwards. All of them have appeared under the form of a globular maſs, ſometimes a little extended in length and highly luminous; having behind it a tail, which, according to every appearance, was compoſed of flames and ſmoke. All of them burſt after they were ſeen to move through a large ſpace, ſometimes over ſeveral diſtricts, with an exploſion which ſhook every thing around. In every inſtance where there has been an opportunity of obſerving the fragments that fell after they burſt, and which ſometimes have ſunk to the depth of ſeveral feet into the earth, they were found to conſiſt of ſcorious maſſes, which contained iron in a metallic or calcined ſtate, pure, or elſe mixed with different kinds of earth and ſulphur. All the ancient and modern accounts, written partly by naturaliſts, and partly by others, are ſo eſſentially ſimilar, that the one ſeems to be only a repetition of the other. This conformity in accounts, the authors of which knew nothing of thoſe given by others, and who could have no intereſt in fabricating ſimilar tales, can ſcarcely have ariſen from accident or fiction, and gives to the related facts, however inexplicable many of them may ſeem, every degree of credibility.

In the third volume of Pallas's Travels, we have an account of a maſs of iron diſcovered by him in Siberia, which Dr Chladni conſiders as having been undoubtedly a fire-ball, or the fragment of a fire-ball. This problematical maſs was found between Kraſnojarſk and Abekanſk in the high ſlate mountains, quite open and uncovered. It weighed 1600 pounds; had a very irregular and ſomewhat compreſſed figure like a rough granite; was covered externally with a ferruginous kind of cruſt; and the inſide conſiſted of malleable iron, brittle when heated, porous like a large ſea ſponge, and having its interſtices filled with a brittle hard vitrified ſubſtance of an amber yellow colour. This texture and the vitrified ſubſtance appeared uniformly throughout the whole maſs, and without any traces of ſlag or artificial fire.

Dr Chladni ſhews with a great deal of ingenuity, that this maſs neither originated by the wet method, nor could have been produced by art, the burning of a foreſt, by lightning, or by a volcanic eruption. It appears to him, therefore, in the higheſt degree probable, that it is of the ſame nature with fire-balls, or, as they have ſometimes been called, *flying dragons*. The Tartars, as we are informed by Pallas, conſidered this maſs as a ſacred relict which had dropped down from heaven; and this circumſtance Dr Chladni conſiders as no ſlight confirmation of his opinion, which he farther ſupports by the following reaſonings:

“1. As fire-balls conſiſt of denſe and heavy ſubſtances, which, by their exceedingly quick movement, and the friction thence excited by the atmoſphere, become electric, are reduced to a ſtate of ignition, and melted by the heat, ſo that they extend to a great ſize, and burſt; it thence follows, that in places where fragments, produced by the burſting of a fire-ball, have been found, ſubſtances endowed with all theſe properties muſt alſo have been found. Iron, however, the principal component part of all the maſſes hitherto found (and he ſpeaks of many beſides that of Pallas), poſſeſſes all theſe properties in a very eminent degree. The weight and toughneſs of the principal component parts of fire-balls, which muſt be very conſiderable, ſince, with the greateſt poſſible diſtention, they retain conſiſtence enough to proceed with the utmoſt velocity through ſuch an immenſe ſpace without decompoſition of their maſs, and without their progreſs being obſtructed by the reſiſtance of the air, agree perfectly well with melted iron; their dazzling white light has by many obſervers been compared to that of melted iron; iron alſo exhibits the ſame appearances of flaming, ſmoking, and throwing out ſparks, and all theſe phenomena are moſt beautiful when they take place in vital air. Of the extenſion by elaſtic fluids expanded by the heat, and of the contraction which follows from cold, traces may be diſcovered in the internal ſpongy nature of the iron maſſes which have been found, and in the globular depreſſions of the exterior hard cruſt ; the latter of which gives us reaſon to ſuppoſe, that in theſe places there have been air-bubbles, which, on cooling, ſunk down. The mixture of ſulphur found in various maſſes, agrees alſo exceedingly well with the phenomena of fire-balls, and eſpecially with the great inflammability of ſulphur in very thin impure air ; for it is well known, that ſulphur in an air-pump will take fire in air, in which few other bodies could do the ſame. In regard to thoſe maſſes in which no ſulphur was found, this may have ariſen from the ſulphur eſcaping in vapour, ſince ſome time after the appearance of fire-balls a ſtrong ſmell of ſulphur has been perceived. The brittleneſs of the Siberian iron maſs when heated, may ariſe from ſome ſmall remains of ſulphur, which may perhaps be the cauſe of the facility with which fragments of this maſs, as well as of another found at Aix-la-Chapelle, could be roaſted.

“ 2. The whole texture of the maſſes betrayed evident ſigns of fuſion. This, however, cannot have been occaſioned by any common, natural, or artificial fire ; and particularly for this reaſon, becauſe iron ſo malleable is not fuſible in ſuch fire, and when it is fuſed with the addition of inflammable matters, loſes its malleability, and becomes like common raw iron. The vitrified ſubſtance in the Siberian maſs is equally incapable of being fuſed in a common fire. The fire, then, muſt have been much ſtronger than that produced by the common, natural, and artificial means ; or the fuſion muſt have been effected by the force of exceedingly ſtrong electricity ; or perhaps both cauſes may have been combined together.

“ 3. It is totally incomprehenſible how, on the high ſlate mountains, where the Siberian maſs was found, at a conſiderable diſtance from the iron mines ; in the chalky ſoil of the extenſive plains of America, where for a hundred miles around there are no iron mines, and not even ſo much as a ſtone to be found ; and at Aix-la-Chapelle, where, as far as the author knows, there are no iron works—ſo many ferruginous particles could be collected in a ſmall ſpace as would be neceſſary to form maſſes of 1600, 15,000, and 17,000, up to 33,600 pounds. This circumſtance ſhews, that theſe maſſes could as little have been fuſed by lightning as by the burning of a foreſt or of foſſile coal. Theſe maſſes were found quite expoſed and uncovered, and not at any depth in the earth, where we can much more readily admit ſuch an accumulation of ferruginous particles to have been melted by the effects of lightning.

“ Should it be aſked, how ſuch maſſes originated, or by what means they were brought into ſuch an inſulated poſition ? this queſtion would be the ſame as if it were aſked how the planets originated. Whatever hypotheſes we may form, we muſt either admit that the planets, if we except the many revolutions which they may have undergone, either on or near their ſurface, have always been ſince their firſt formation, and ever will be the ſame ; or that nature, acting on created matter, poſſeſſes the power to produce worlds and whole ſyſtems to deſtroy them, and from their materials to form new ones. For the latter opinion there are, indeed, more grounds than for the former, as alternations of deſtruction and creation are exhibited by all organiſed and unorganiſed bodies on our earth, which gives us reaſon to ſuſpect that nature, to which greatneſs and ſmallneſs, conſidered in general, are merely relative terms, can produce more effects of the ſame kind on a larger ſcale. But many variations have been obſerved on diſtant bodies, which, in ſome meaſure, render the laſt opinion probable. For example, the appearing and total diſappearing of certain ſtars, when they do not depend upon periodical changes. If we now admit that planetary bodies have ſtarted into exiſtence, we cannot ſuppoſe that ſuch an event can have otherwiſe taken place, than by conjecturing that either particles of matter, which were before diſperſed through infinite ſpace in a more ſoft and chaotic condition, have united together in large maſſes by the power of attraction ; or that new planetary bodies have been formed from the fragments of much larger ones that have been broken to pieces, either perhaps by ſome external ſhock, or by an internal exploſion. Let whichever of theſe hypotheſes be the trueſt, it is not improbable, or at leaſt not contrary to nature, if we ſuppoſe that a large quantity of ſuch material particles, either on account of their too great diſtance, or becauſe prevented by a ſtronger movement in another direction, may not have united themſelves to the larger accumulating maſs of a new world ; but have remained inſulated, and, impelled by ſome ſhock, have continued their courſe through infinite ſpace, until they approached ſo near to ſome planet, as to be within the ſphere of its attraction, and then by falling down to occaſion the phenomena before mentioned.”

Whether Chladni be a philoſopher of the French ſchool we know not ; but ſome parts of his theory tend ſtrongly towards materialiſm ; and the arguments by which he attempts to prop thoſe parts are peculiarly weak. When he talks of *Nature* producing worlds, he either ſubſtitutes Nature for Nature's God, or utters jargon which has no meaning. In what ſenſe the word Nature is uſed by every philoſopher of a ſound mind, we have elſewhere been at ſome pains to ſhew (ſee RIVER, n° 116, *Encycl.*) ; but how abſurd would it be to ſay, that the ſyſtem of general laws, by which the Author and Governor of the univerſe connects together its various parts, and regulates all their operations, poſſeſſes, independently of him, the “ power to produce worlds and whole ſyſtems, to deſtroy them, and from their materials to form new ones !”

As Chladni admits, or talks as if he admitted, the creation of matter, it would be wrong to impute to him this abſurdity ; but if by *Nature* he means GOD, and he can conſiſtently mean nothing elſe, we beg leave to affirm, that it is *directly contrary* to every notion which we can form of Nature in *this ſenſe*, “ to ſuppoſe that a large quantity of material particles, either on account of their *diſtance*, or becauſe prevented by a *ſtronger movement* in another direction, have not united themſelves to the larger accumulating maſs of a new world, but remained inſulated, and impelled by ſome ſhock, have continued their courſe through infinite ſpace, &c.” Is there any diſtance to which God cannot reach, or any movement ſo ſtrong as to reſiſt his power ? Our author's language is indeed confuſed, and probably his ideas were not very clear. When he ſpeaks of the particles of matter being at firſt diſperſed through infinite ſpace, and afterwards united by the power of attraction, he revives the queſtion which was long ago diſcuſſed between Newton and Bentley, and diſcuſſed in ſuch a manner as ſhould have ſilenced for ever the bablings of thoſe who form worlds by attraction.

“ The hypotheſis (ſays Newton) of matter's being at firſt evenly ſpread through the heavens, is, in my opinion, inconſiſtent with the hypotheſis of innate gravity without a ſupernatural power to reconcile them; and therefore infers a Deity. For if there be innate gravity, it is impoſſible now for the matter of the earth, and all the planets and ſtars, to fly up from them, and become evenly ſpread through all the heavens, without a ſupernatural power; and certainly that which can never be hereafter without a ſupernatural power, could never be heretofore without the ſame power”. Dr Chladni, indeed, does not ſay that his particles of matter were *evenly* diſperſed through infinite ſpace; but ſuch muſt be his meaning, if he has any meaning: for matter *unevenly* diſperſed muſt, by an innate attraction, be united as ſoon as it exiſts, and ſo united as not to leave ſmall fragments of it to wander, we know not why, through the trackleſs void. Turn matter on all ſides, make it eternal or of late production, finite or infinite, there can be no regular ſyſtem produced but by a voluntary and meaning agent; and therefore, if it be true that fire-balls are maſſes of denſe matter, coeval with the planetary ſyſtem, exiſting in the celeſtial regions, and thence conveyed to our earth, they muſt have been formed, and their motions impreſſed upon them, by the Author of Nature for ſome wiſe purpoſe, though by us that purpoſe may never be diſcovered. One thing ſeems pretty clear, that wherever they may be formed, the phenomena attending their burſting, account ſufficiently for the notions of thunderbolts which have been generally entertained in all ages, and in every country.

Greek-Fire (ſee *Wild-Fire, Encycl.*). In the ſecond volume of Mr Nicholſon's Philoſophical Journal, we have the following receipt for making this compoſition, taken from ſome manuſcripts of Leonard de Vinci, who flouriſhed in the end of the fifteenth and beginning of the ſixteenth centuries, and who appears to have advanced far before his contemporaries in phyſical ſcience. Take the charcoal of willow, nitre, brandy, reſin, ſulphur, pitch, and camphor. Mix the whole well together over the fire. Plunge a woollen cord in the mixture, and form it into balls, which may afterwards be provided with ſpikes. Theſe balls, being ſet on fire, are thrown into the enemy's veſſels. It is called the Greek fire, and is a ſingular compoſition, for it burns even upon the water. Callinicus the architect taught this compoſition to the Romans (of Conſtantinople), who derived great advantage from it, particularly under the emperor Leo, when the Orientals attacked Conſtantinople. A great number of their veſſels were burned by means of this compoſition.

The compoſition of the Greek fire thus given by Vinci is found in nearly the ſame words in ſome of the writings of Baptiſta Porta; whence it appears that both authors derived their information from the ſame ſource. A compoſition which burnt without acceſs to the atmoſphere could not fail to fill the minds of our forefathers with wonder; but the modern diſcoveries in chemiſtry have diſcloſed the ſecret, by ſhewing, that the combuſtion is carried on by means of the oxygen contained in the nitre.

Raſant or *Razant Fire*, is a fire from the artillery and ſmall arms, directed parallel to the horizon, or to thoſe parts of the works of a place that are defended.

Running Fire is when ranks of men fire one after another; or when the lines of an army are drawn out to fire on account of a victory; in which caſe each ſquadron or battalion takes the fire from that on its right, from the right of the firſt line to the left, and from the left to the right of the ſecond line, &c.

FISHERSFIELD, a townſhip in Hillſborough co. New-Hampſhire, incorporated in 1763, containing 331 inhabitants. Sunapee pond lies partly here, and in the townſhip of Wendel. It is about 16 miles eaſterly of Charleſtown.—*Morſe.*

FISHER's *Iſland*, in Long-Iſland ſound, lies oppoſite to Groton in Connecticut, is about 10 miles in length and 2 in breadth, having a light ſoil, favorable for raiſing ſheep. It produces alſo wheat and other grain. It is annexed to the townſhip of Southhold, in Suffolk co. on Long-Iſland.—*ib.*

FISHING, the art of catching fiſh. See Angling, Fishery, and Fishing, &c. *Encycl.*

Chineſe Fishing. We venture to give this appellation to ſome very ingenious contrivances of the people of China for catching in their lakes, not only fiſh, but water-fowl. For the purpoſe of catching fiſh they have trained a ſpecies of pelican, reſembling the common corvorant, which they call the *Leu-tze*, or fiſhing bird. It is brown, with a white throat, the body whitiſh beneath, and ſpotted with brown; the tail is rounded, the irrides blue, and the bill yellow. Sir George Staunton, who, when the embaſſy was proceeding on the ſouthern branch of the great canal, ſaw thoſe birds employed, tells us, that on a large lake, cloſe to the eaſt ſide of the canal, are thouſands of ſmall boats and rafts, built entirely for this ſpecies of fiſhery. On each boat or raft are ten or a dozen birds, which, at a ſignal from the owner, plunge into the water; and it is aſtoniſhing to ſee the enormous ſize of fiſh with which they return, graſped within their bills. They appeared to be ſo well trained, that it did not require either ring or cord about their throats to prevent them from ſwallowing any portion of their prey, except what their maſter was pleaſed to return to them for encouragement and food. The boat uſed by theſe fiſhermen is of a remarkable light make, and is often carried to the lake, together with the fiſhing birds, by the men who are there to be ſupported by it.

The ſame author ſaw the fiſhermen buſy on the great lake Wee-chaung-hee; and he gives the following account of a very ſingular method practiſed by them for catching the fiſh of the lake without the aid of birds, of net, or of hooks.

To one ſide of a boat a flat board, painted white, is fixed, at an angle of about 45 degrees, the edge inclining towards the water. On moonlight nights the boat is ſo placed that the painted board is turned to the moon, from whence the rays of light ſtriking on the whitened ſurface, give to it the appearance of moving water; on which the fiſh being tempted to leap as on their element, the boatman raiſing with a ſtring the board, turn the fiſh into the boat.

Water-fowl are much ſought after by the Chineſe, and are taken upon the ſame lake by the following ingenious device. Empty jars or gourds are ſuffered to float about upon the water, that ſuch objects may become familiar to the birds. The fiſherman then wades into the lake with one of thoſe empty veſſels upon his head, and walks gently towards a bird; and lifting up his arm, draws it down below the ſurface of the water without any diſturbance or giving alarm to the reſt, ſeveral of whom he treats in the ſame manner, until he fills the bag he had brought to hold his prey. The contrivance itſelf is not ſo ſingular, as it is that the ſame exactly ſhould have occurred in the new continent, as Ulloa aſſerts, to the natives of Carthagena, upon the lake Cienega de Teſias.

FISHING *Bay*, in Maryland, lies on the E. ſide of Cheſapeak bay, partly in Dorcheſter and Somerſet counties. It receives ſeveral rivers from each county, the chief of which are Wicomico, Nanticoke; alſo Tranſquaking and Blackwater creeks. The entrance into this large bay lies between Goldſborough and Devil's iſlands.—*Morſe.*

FISHING *Bay*, on the S. ſide of lake Ontario, is about 37 miles E. of Fort Niagara.—*ib.*

FISHING-CREEK, a townſhip on Suſquehanna river, in Pennſylvania.—*ib.*

FISHKILL, a poſt town in Dutcheſs co. New-York, 5 miles E. of Hudſon river, on Fiſhkill or creek, at the foot of the Highlands, which riſe S. of it; containing about 30 houſes, a church for Epiſcopalians, and one for Low Dutch. The townſhip is very extenſive, and contained, in 1790, 5941 inhabitants, of whom 601 were ſlaves. It lies 14 miles S. by E. of Poughkeepſie, oppoſite Newburgh, and 66 N. of New-York city. There are a few houſes only at the Landing, on the margin of the river.—*ib.*

FISH *Kill*, or *Creek*, on which the town above deſcribed ſtands, and from which it derives its name, is ſmall, and empties into Hudſon river, about a mile below the Landing, and nearly oppoſite New-Windſor.—*ib.*

Alſo, the name of a ſmall ſtream which runs S. W. into Oneida lake.

Likewiſe, a ſtream which riſes from Saratoga lake, and runs 6 miles eaſterly to the Hudſon. Its mouth is oppoſite Batten kill, 2 miles above Saratoga town; and on the N. ſide of which Gen. Burgoyne's army laid down their arms as priſoners.—*ib.*

FISTULA LACHRYMALIS is a diſeaſe which, in all its ſtages, has been treated of in the article SURGERY, chap. xiv. *Encycl.* A work, however, has been lately publiſhed by JAMES WARE ſurgeon, in which there is the deſcription of an operation for its cure conſiderably different from that moſt commonly uſed, and which, while it is ſimple, the author's experience has aſcertained to be ſucceſsful.

In the cure of this diſeaſe, which is very troubleſome, and not very uncommon, it is a well known practice to inſert a metallic tube in the naſal duct of the lachrymal canal: but the advantage derived from this operation is not at all times laſting. Among other cauſes of failure, Mr Ware notices the lodgment of inſpiſſated mucus in the cavity of the tube. To remedy this defect, he recommends the following operation.

“ If the diſeaſe has not occaſioned an aperture in the lachrymal ſac, or if this aperture be not ſituated in a right line with the longitudinal direction of the naſal duct, a puncture ſhould be made into the ſac, at a ſmall diſtance from the internal juncture of the palpebræ, and nearly in a line drawn horizontally from this juncture towards the noſe with a ſpear-pointed lancet. The blunt end of a ſilver probe, of a ſize rather ſmaller than the probes that are commonly uſed by ſurgeons, ſhould then be introduced through the wound, and gently, but ſteadily, puſhed on in the direction of the naſal duct, with a force ſufficient to overcome the obſtruction in this canal, and until there is reaſon to believe that it has freely entered into the cavity of the noſe. The poſition of the probe, when thus introduced, will be nearly perpendicular; its ſide will touch the upper edge of the orbit; and the ſpace between its bulbous end in the noſe and the wound in the ſkin will uſually be found, in a full-grown perſon, to be about an inch and a quarter, or an inch and three-eighths. The probe is then to be withdrawn, and a ſilver ſtyle, of a ſize nearly ſimilar to that of the probe, but rather ſmaller, about an inch and three-eighths in length, with a flat head, like that of a nail, but placed obliquely, that it may fit cloſe on the ſkin, is to be introduced through the duct, in place of the probe, and to be left conſtantly in it. For the firſt day or two after the ſtyle has been introduced, it is ſometimes adviſable to waſh the eye with a weak ſaturnine lotion, in order to obviate any tendency to inflammation which may have been excited by the operation; but this in general is ſo ſlight, that our author has rarely had occaſion to uſe any application to remove it. The ſtyle ſhould be withdrawn once every day for about a week, and afterwards every ſecond or third day. Some warm water ſhould each time be injected through the duct into the noſe, and the inſtrument be afterwards replaced in the ſame manner as before. Mr Ware formerly uſed to cover the head of the ſtyle with a piece of diachylon plaſter ſpread on black ſilk, but has of late obviated the neceſſity for applying any plaſter by blackening the head of the ſtyle with ſealing-wax.

“ The effect (ſays he) produced by the ſtyle, when introduced in the way above mentioned, at firſt gave me much ſurpriſe. It was employed with a view ſimilar to that with which Mr Pott recommends the introduction of a bougie; viz. to open and dilate the naſal duct, and thus to eſtabliſh a paſſage, through which the tears might afterwards be conveyed from the eye to the noſe. I expected, however, that whilſt the ſtyle continued in the duct the obſtruction would remain, and of courſe that the watering of the eye, and the weakneſs of the ſight, would prove as troubleſome as they had been before the inſtrument was introduced. I did not imagine that any eſſential benefit could reſult from the operation until the ſtyle was removed, and the paſſage thereby opened. It was an agreeable diſappointment to me to find that the amendment was much more expeditious. The watering of the eye almoſt wholly ceaſed as ſoon as the ſtyle was introduced; and in proportion as the patient amended in this reſpect, his ſight alſo became more ſtrong and uſeful. The ſtyle, therefore, ſeems to act in a twofold capacity: firſt, it dilates the obſtructed paſſage; and then, by an attraction ſomewhat ſimilar to that of a capillary tube, it guides the tears through the duct into the noſe.

“ The wound that I uſually make into the ſac, if the ſupperative proceſs has not formed a ſuitable aperture in this part, is no larger than is juſt ſufficient to admit the end of the probe or ſtyle; and this, in general, in a little time, becomes a fiſtulous orifice, through which the ſtyle is paſſed without occaſioning the ſmalleſt degree of pain. The accumulation of matter in the lachrymal ſac, which, previous to the operation, is often copious, uſually abates ſoon after the operation has been performed; and, in about a week or ten days, the treatment of the caſe becomes ſo eaſy, that the patient himſelf, or ſome friend or ſervant who is conſtantly with him, is fully competent to do the whole that is neceſſary. It conſiſts ſolely in withdrawing the ſtyle two or three times in the week, occaſionally injecting ſome warm water, and then replacing the inſtrument in the ſame way in which it was done before.

“ It is not eaſy to aſcertain the exact length of time that the ſtyle ſhould be continued in the duct. Some have worn it many years, and, not finding any inconvenience from the inſtrument, are ſtill afraid and unwilling to part from it. Others, on the contrary, have diſuſed it at the end of about a month or ſix weeks, and have not had the ſmalleſt return of the obſtruction afterwards.”

The author relates ſo many ſucceſsful caſes of this operation, that we thought it our duty to record his method in this Supplementary volume of our general repoſitory of arts and ſciences; for a ſucceſsful practice, as well in ſurgery as in phyſic, muſt reſt on the baſis of experience.

FITCHBURGH, a poſt town of Maſſachuſetts, Worceſter co. 23 miles N. of Worceſter, 24 from Concord, and 42 N. W. of Boſton. It has 1151 inhabitants.—*Morſe.*

FITZWILLIAM, a townſhip in Cheſhire co. New-Hampſhire, about 16 miles E. of Connecticut river, and ſeparated from Royalſton in Worceſter co. Maſſachuſetts, by the ſtate line. It was incorporated in 1773, and contains 1038 inhabitants.—*ib.*

OBLIQUE or SECOND FLANK, or *FLANK of the Curtain,* is that part of the curtain from whence the face of the oppoſite baſtion can be ſeen, being contained between the lines raſant and fichant, or the greater and leſs lines of defence; or the part of the curtain between the flank and the point where the fichant line of defence terminates.

Covered, Low or *Retired FLANK,* is the platform of the caſemate which lies hid in the baſtion, and is otherwiſe called the *orillon.*

Fichant FLANK, is that from whence a cannon playing, fires directly on the face of the oppoſite baſtion.

Raſant or *Razant FLANK,* is the point from whence the line of defence begins, from the conjunction of which with the curtain the ſhot only raſeth the face of the next baſtion, which happens when the face cannot be diſcovered but from the flank alone.

FLATBUSH, the chief town of King's co. Long-Iſland, New-York. It is a pleaſant and healthy town, ſituated on a ſmall bay which opens E. from New-York harbor, and is 5 miles S. by E. from New-York city. It contains a number of dwelling-houſes, moſtly in one ſtreet; many of which are elegant and commodious. The inhabitants are chiefly of Dutch extraction. It contains 941 inhabitants, of whom 107 are qualified electors, and 378 are ſlaves. The productions are various kinds of fruit, vegetables, grain, &c. which find a ready market in the metropolis. The land lies low; and in ſummer the whole townſhip appears like an extenſive garden. The public buildings are a Dutch church, a court-houſe, and an academy, called Eraſmus Hall, the moſt flouriſhing of all the academies in the ſtate. It is in a pleaſant and healthful ſituation, 4 miles from Brookline ferry.

A bloody battle was fought near this town on the 27 Auguſt, 1776, when the Americans were defeated by the Britiſh with great loſs. The remains of the American army retreated to New-York under the cover of a thick fog.—*Morſe.*

FLATLANDS, a ſmall townſhip in Kings co. Long-Iſland, diſtant from New-York city 6 or 7 miles. It contains 423 inhabitants, of whom 44 are qualified to be electors, and 137 are ſlaves.—*ib.*

FLAT *Rock,* is an expanſive, clear, flat rock, but a little above the ſurface of the ground, and near the banks of a delightful rivulet of excellent water, which is one of the head branches of Great Ogeechee river, in Georgia. This is a common rendezvous or camping place for traders and Indians.—*ib.*

FLATTERY, CAPE, ſo named by captain Cook, on account of its promiſing at a diſtance what it denied on a nearer approach. Lat. 48. 15. long. 235. 30. E. This cape, captain Ingraham of Boſton, found to be the S. ſide of the entrance of the ſtraits of Juan de Fuca. N. lat. 48 25. W. long. 124. 52.—*ib.*

FLEMINGTON, a ſmall poſt town of New-Jerſey, in Hunterdon co. lies about 6 miles N. eaſtward of Amwell on Delaware river, 23 N. N. W. of Trenton, 9 S. of Pittſtown, and 53 N. E. by N. of Philadelphia. It contains about a dozen compact houſes.—*ib.*

FLETCHER, a townſhip in Franklin co. Vermont, containing only 47 inhabitants. It has Cambridge on the S. E. and Georgia W.—*ib.*

FLIE or FLY, that part of the mariner's compaſs on which the thirty-two points of the wind are drawn, and over which the needle is placed, and faſtened underneath.

FLINT *River,* a conſiderable river of Georgia, which riſes in the country of the Creek Indians, and running a S. and thence a S. W. courſe, joins the Appalachicola, at its entrance into Florida. The Flint is about 30 rods wide, and from 12 to 15 feet deep in ſummer, and has a gentle current. The territory lying on this river, eſpecially on the upper part of it, preſents every appearance of a delightful and fruitful region in ſome future day; it being a rich ſoil, and exceedingly well ſituated for every branch of agriculture, and offers an uninterrupted navigation to the bay of Mexico, and Atlantic ocean, and thence to the Weſt-India iſlands and over the whole world. There are a number of villages of Creek Indians on this river. —*Morſe.*

FLINT, a ſmall river, about 28 miles long, in the Geneſſee country, in New-York, which runs N. N. E. into Canandarqua creek.—*ib.*

FLINTSTON, a plantation in Cumberland co. Maine, having 180 inhabitants. It has one eminence in it called Saddle-Back mountain, but the country in general is level enough for cultivation. One half of it is covered with pine and white oak.—*ib.*

FLOATING Bodies are ſuch as ſwim on the ſurface of a fluid, of which the moſt important are ſhips and all kinds of veſſels employed in war and in commerce. Every ſeaman knows of how much conſequence it is to determine the ſtability of ſuch veſſels, and the poſitions which they aſſume when they float freely and at reſt on the water. To accompliſh this, it is neceſſary to ſtate the principles on which that ſtability and theſe poſitions depend; and this has been done with ſo much ingenuity and ſcience by George Atwood, Eſq; F. R. S. in the Philoſophical Tranſactions for the year 1796, that we are perſuaded a large claſs of our readers will thank us for inſerting an abſtract of his memoir in this place.

A floating body is preſſed downwards by its own weight in a vertical line that paſſes through its centre of gravity; and it is ſuſtained by the upward preſſure of a fluid, acting in a vertical line that paſſes through the centre of gravity of the immerſed part; and unleſs theſe two lines be coincident, ſo that the two centres of gravity may be in the ſame vertical line, the ſolid will revolve on an axis, till it gains a poſition in which the equilibrium of floating will be permanent. Hence it appears that it is neceſſary, in the firſt place, to aſcertain the proportion of the part immerſed to the whole; for which purpoſe the ſpecific gravity of the floating body muſt be known; and then it muſt be determined, by geometrical or analytical methods, in what poſitions the ſolid can be placed on the ſurface of the fluid, ſo that the two centres of gravity already mentioned may be in the ſame vertical line when a given part of the ſolid is immerſed under the ſurface of the fluid. When theſe preliminaries are ſettled, ſomething ſtill remains to be done. Poſitions may be aſſumed in which the circumſtances juſt recited concur, and yet the ſolid will aſſume ſome other poſition in which it will permanently float. If a cylinder, *e. g.* having its ſpecific gravity to that of the fluid on which it floats as 3 to 4, and its axis to the diameter of the baſe as 2 to 1, be placed on the fluid with its axis vertical, it will ſink to a depth equal to a diameter and a half of the baſe; and while its axis is preſerved in a vertical poſition by external force, the centres of gravity of the whole ſolid and of the immerſed part will remain in the ſame vertical line: but when the external force that ſuſtained it is removed, it will decline from its upright poſition, and will permanently float with its axis horizontal. If the axis be ſuppoſed to be half of the diameter of the baſe, and be placed vertically, the ſolid will ſink to the depth of three-eighths of its diameter; and in that poſition it will float permanently. If the axis be made to incline to the vertical line, the ſolid will change its poſition until it ſettles permanently with the axis perpendicular to the horizon.

Whether, therefore, a ſolid floats permanently, or overſets when placed on the ſurface of a fluid, ſo that the centre of gravity of the ſolid and that of the part immerſed ſhall be in the ſame vertical line, it is ſaid to be in a poſition of equilibrium; and of this equilibrium there are three ſpecies, viz. the equilibrium of ſtability, in which the ſolid floats permanently in a given poſition: the equilibrium of inſtability, in which the ſolid, though the two centres of gravity already mentioned are in the ſame vertical line, ſpontaneouſly overſets, unleſs ſupported by external force; and the equilibrium of indifference, or the inſenſible equilibrium, in which the ſolid reſts on the fluid indifferent to motion, without tendency to right itſelf when inclined, or to incline itſelf farther.

If a ſolid body floats permanently on the ſurface of a fluid, and external force be applied to incline it from its poſition, the reſiſtance oppoſed to this inclination is termed the ſtability of floating. Among various floating bodies, ſome loſe their quieſcent poſition, and ſome gain it, after it has been interrupted, with greater facility and force than others.

Some ſhips at ſea (*e. g.*) yield to a given impulſe of the wind, and ſuffer a greater inclination from the perpendicular than others. As this reſiſtance to heeling or pitching, duly regulated, has been deemed of importance in the conſtruction of veſſels, ſeveral eminent mathematicians have inveſtigated rules for determining the ſtability of ſhips from their known dimenſions and weight, without recurring to actual trial. To this claſs we may refer Bouguer, Euler, Fred. Chapman, and others, who have laid down theorems for this purpoſe, founded on a ſuppoſition that the inclinations of ſhips from their quieſcent poſitions are evaneſcent, or, in a practical ſenſe, very ſmall.

"But ſhips at ſea (ſays our ingenious author) are known to heel through angles of 10° 20°, or even 30°, and therefore a doubt may ariſe how far the rules, demonſtrated on the expreſs condition that the angles of inclination are of evaneſcent magnitude, ſhould be admitted as practically applicable in caſes where the inclinations are ſo great."—"If we admit that the theory of ſtatics can be applied with any effect to the practice of naval architecture, it ſeems to be neceſſary that the rules, inveſtigated for determining the ſtability of veſſels, ſhould be extended to thoſe caſes in which the angles of inclination are of any magnitude likely to occur in the practice of navigation."

A ſolid body placed in the ſurface of a lighter fluid, at the depth correſponding to the relative gravities, cannot change its poſition by the combined actions of its weight, and the preſſure of the fluid, except by revolving on ſome horizontal axis which paſſes through the centre of gravity: but as many axes may be drawn through this point of the floating body in a direction parallel to the horizon, and the motion of the ſolid reſpects one axis only, this axis muſt be determined by the figure of the body, and the particular nature of the caſe. When this axis of motion, as it is called, is determined, and the ſpecific gravity of the ſolid is known, "the poſitions of permanent floating will be obtained, firſt by finding the ſeveral poſitions of equilibrium through which the ſolid may be conceived to paſs, while it revolves round the axis of motion; and ſecondly, by determining in which of thoſe poſitions the equilibrium is permanent, and in which of them it is momentary and unſtable."

Such as we have now briefly ſtated are the general principles, on which are founded Mr Atwood's inveſtigations for determining the poſitions aſſumed by homogeneous bodies, floating on a fluid ſurface; and alſo for determining the ſtability of ſhips and of other floating bodies. We cannot farther accompany him in his elucidation of them, in the problems to the ſolution of which they lead, and in the important practical purpoſes of naval architecture to which they are referred. The whole paper, comprehending no leſs than 85 pages, is curious and valuable; it abounds with analytical and geometrical diſquiſitions of the moſt elaborate kind; and it ſerves to enlarge our acquaintance with a ſubject that is not only highly intereſting to the ſpeculative mathematician, but extremely uſeful in its practical application.

With this latter view, the author ſeems to have directed his attention to the various objects of inquiry which this article comprehends. They are ſuch as intimately relate to the theory of naval architecture, ſo far as it depends on the pure laws of mechanics, and they contribute to extend and improve this theory. The union of thoſe principles that are deduced from the laws of motion, with the knowledge which is derived from obſervation and experience, cannot fail to eſtabliſh the art of conſtructing veſſels on its true baſis, and gradually to lead to farther improvements of the greateſt importance and utility. To this purpoſe, the author obſerves, that

“ If the proportions and dimenſions adopted in the conſtruction of individual veſſels are obtained by exact geometrical menſurations, and calculations founded on them, and obſervations are made on the performance of theſe veſſels at ſea; experiments of this kind, ſufficiently diverſified and extended, ſeem to be the proper grounds on which theory may be effectually applied in developing and reducing to ſyſtem thoſe intricate, ſubtil, and hitherto unperceived cauſes, which contribute to impart the greateſt degree of excellence to veſſels of every ſpecies and deſcription. Since naval architecture is reckoned among the practical branches of ſcience, every voyage may be conſidered as an experiment, or rather as a ſeries of experiments, from which uſeful truths are to be inferred towards perfecting the art of conſtructing veſſels: but inferences of this kind, conſiſtently with the preceding remark, cannot well be obtained, except by acquiring a perfect knowledge of all the proportions and dimenſions of each part of the ſhip; and ſecondly, by making and recording ſufficiently numerous obſervations on the qualities of the veſſel, in all the varieties of ſituation to which a ſhip is uſually liable in the practice of navigation.”

In the valuable miſcellany entitled the *Philoſophical Magazine*, there is a paper on this ſubject by Mr John George Engliſh, teacher of mathematics and mechanical philoſophy; which, as it is not long, and is eaſily underſtood, we ſhall take the liberty to tranſcribe.

“ However operoſe and difficult the calculations neceſſary to determine the ſtability of nautical veſſels may, in ſome caſes, be, yet they all depend, ſays this author, upon the four following ſimple and obvious theorems, accompanied with other well known ſtereometrical and ſtatical principles.

“ *Theorem* 1. Every floating body diſplaces a quantity of the fluid in which it floats, equal to its own weight: and conſequently, the ſpecific gravity of the fluid will be to that of the floating body, as the magnitude of the whole is to that of the part immerſed.

“ *Theorem* 2. Every floating body is impelled downward by its own eſſential power, acting in the direction of a vertical line paſſing through the centre of gravity of the whole; and is impelled upward by the reaction of the fluid which ſupports it, acting in the direction of a vertical line paſſing through the centre of gravity of the part immerſed: therefore, unleſs theſe two lines are coincident, the floating body thus impelled muſt revolve round an axis, either in motion or at reſt, until the equilibrium is reſtored.

“ *Theorem* 3. If by any power whatever a veſſel be deflected from an upright poſition, the perpendicular diſtance between two vertical lines paſſing through the centres of gravity of the whole, and of the part immerſed reſpectively, will be as the ſtability of the veſſel, and which will be poſitive, nothing, or negative, according as the metacentre is above, coincident with, or below, the centre of gravity of the veſſel.

“ *Theorem* 4. The common centre of gravity of any ſyſtem of bodies being given in poſition, if any one of theſe bodies be moved from one part of the ſyſtem to another, the correſponding motion of the common centre of gravity, eſtimated in any given direction, will be to that of the aforeſaid body eſtimated in the ſame direction, as the weight of the body moved is to that of the whole ſyſtem.

“ From whence it is evident, that in order to aſcertain the ſtability of any veſſel, the poſition of the centres of gravity of the whole, and of the part immerſed, muſt be determined; with which, and the dimenſions of the veſſel, the line of floatation, and angle of deflection, the ſtability or power either to right itſelf or overturn, may be found.

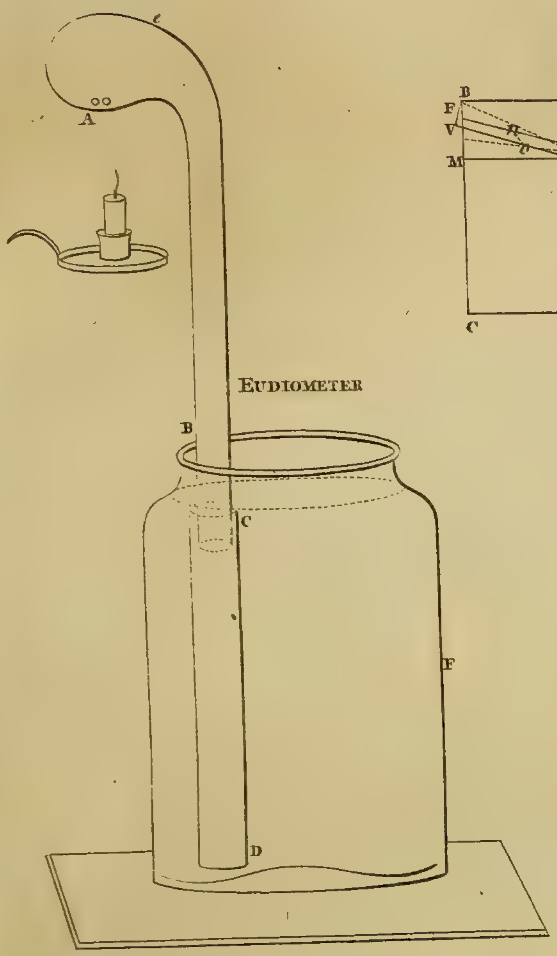
“ In ſhips of war and merchandize, the calculations neceſſary for this purpoſe become unavoidably very operoſe and troubleſome; but they may be much facilitated by the experimental method pointed out in the New Tranſactions of the Swediſh Academy of Sciences, firſt quarter of the year 1787, page 48.

“ In river and canal boats, the regularity and ſimplicity of the form of the veſſel itſelf, together with the compact diſpoſition and homogeneal quality of the burden, render that method for them unneceſſary, and make the requiſite calculations become very eaſy. Veſſels of this kind are generally of the ſame tranſverſe ſection throughout their whole length, except a ſmall part in prow and ſtern, formed by ſegments of circles or other ſimple curves; therefore a length may eaſily be aſſigned ſuch, that any of the tranſverſe ſections being multiplied thereby, the product will be equal to the whole ſolidity of the veſſel. The form of the ſection ABCD is for the moſt part either rectangular, as in fig. 1. trapezoidal, as in fig. 2. or mixtilineal as in fig. 3. in all which MM repreſents the line of floatation when upright, and EF that when inclined at any angle MXE; alſo G repreſents the centre of gravity of the whole veſſel, and R that of the part immerſed.

Plate XXVIII.

“ If the veſſel be loaded quite up to the line AB, and the ſpecific gravity of the boat and burden be the ſame, then the point G is ſimply the centre of gravity of the ſection ABCD; but if not, the centres of gravity of the boat and burden muſt be found ſeparately, and reduced to one by the common method, namely, by dividing the ſum of the momenta by the ſum of weights, or areas, which in this caſe are as the weights. The point R is always the centre of gravity of the ſection MMCD, which, if conſiſting of different figures, muſt alſo be found by dividing the ſum of the momenta by the ſum of the weights as common. Theſe two points being found,

PLATE XXVIII



EUDIOMETER

FLOATING BODIES

Fig 1.

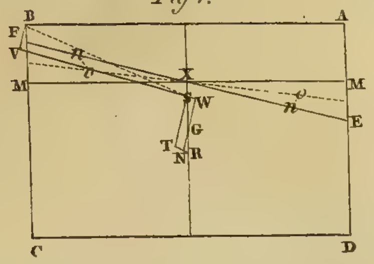


Fig 2.

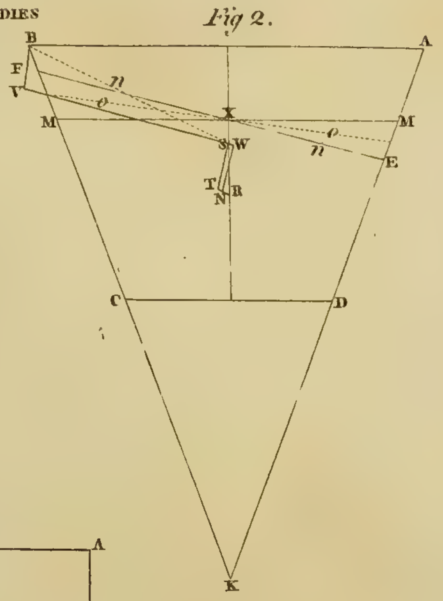
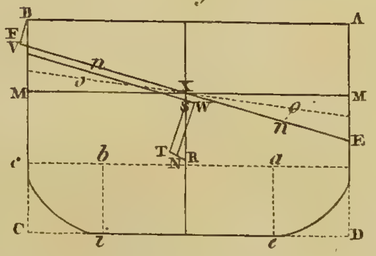


Fig 3.



EUPHORBIA

Fig 1.

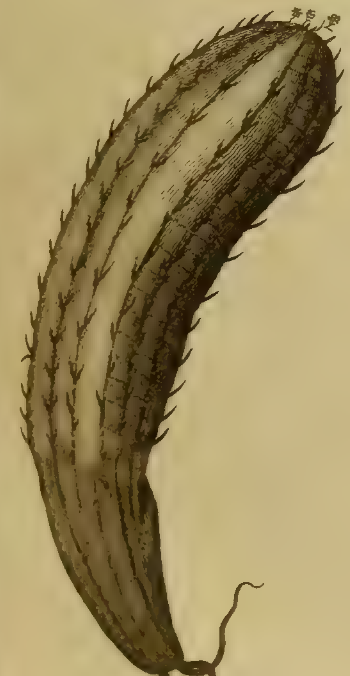


Fig 2.

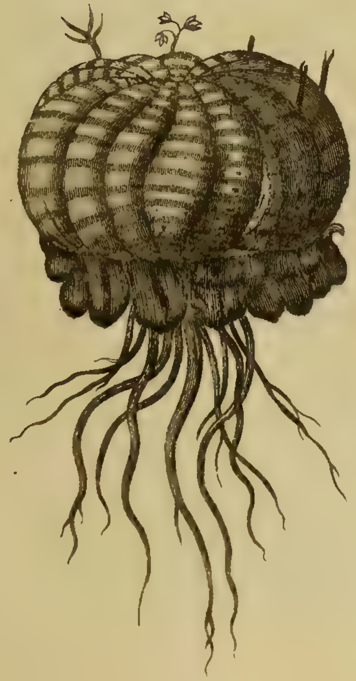
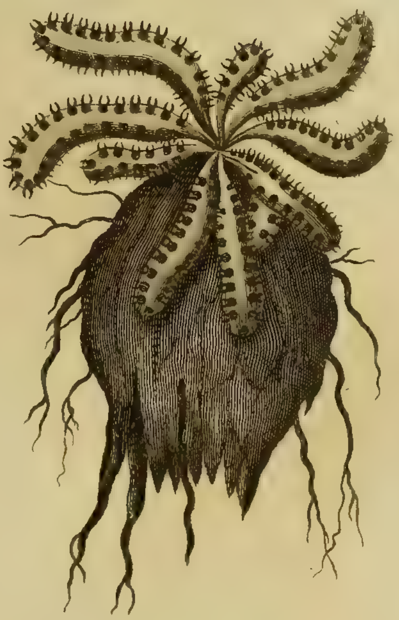


Fig 3.



Lawson sc.

the next thing neceſſary is to determine the area of the two equal triangles MXE, MXF, their centres of gravity *o*, *o*, and the perpendicular projected diſtance *n n* of theſe points on the water line EF. This being done, through R, and parallel to EF draw RT = a fourth proportional to the whole area MMCD, either triangle MXE or MXF, and the diſtance *n n*; through T, and at right angles to RT or EF, draw TS meeting the vertical axis of the veſſel in S the metacentre; alſo through the points G, B, and parallel to ST, draw NGW and BV; moreover through S, and parallel to EF, draw WSV, meeting the two former in V and W; then SW is as the ſtability of the veſſel, which will be poſitive, nothing or negative, according as the point S is above, coincident with, or below, the point G. If now we ſuppoſe W to repreſent the weight of the whole veſſel and burden (which will be equal to the ſection MMCD multiplied by the length of the veſſel), and P to repreſent the required weight applied at the gunwale B to ſuſtain the veſſel at the given angle of inclination; we ſhall always have this proportion: as VS : SW : : W : P; which proportion is general, whether SW be poſitive or negative; it muſt only in the latter caſe be ſuppoſed to act upward to prevent an overturn.

"In the rectangular veſſel, of given weight and dimenſions, the whole proceſs is ſo evident, that any farther explanation would be unneceſſary. In the trapezoidal veſſel, after having found the points G and R, let AD, BC be produced until they meet in K. Then, ſince the two ſections MMCD, EFDC are equal, the two triangles MMK, EFK are alſo equal; and therefore the rectangle EK × KF = KM × KM = $\overline{KM}^2$; and ſince the angle of inclination is ſuppoſed to be known, the angles at E and F are given. Conſequently, if a mean proportional be found between the ſines of the angles at E and F, we ſhall have the following proportions:

"As the mean proportional thus found : ſine ∠ E : : KM : KF, and as the ſaid mean proportional : ſine ∠ F : : KM : KE; therefore ME, MF become known: from whence the area of either triangle MXE or MXF, the diſtance *n n*, and all the other requiſites, may be found.

"In the mixtilineal ſection, let AB = 9 feet = 108 inches, the whole depth = 6 feet = 72 inches, and the altitude of MM the line of floatation 4 feet or 48 inches; alſo let the two curvelinear parts be circular quadrants of two feet, or 24 inches radius each. Then the area of the two quadrants = 904·7808 ſquare inches, and the diſtance of their centres of gravity from the bottom = 13·8177 inches very nearly; alſo the area of the included rectangle *a b i e* = 1440 ſquare inches, and the altitude of its centre of gravity 12 inches; in like manner, the area of the rectangle AB *c d* will be found = 5184 ſquare inches, and the altitude of its centre of gravity 48 inches: therefore we ſhall have

Momentum of the two quad.	= 904·7808	× 13·8177	= 12501·98966016
Moment. of the rectan. *a b i e*	= 1440·	× 12	= 17280·
Moment. of the rectan. AB *c d*	= 5184·	× 48	= 248832·
	7528·7808		278613·98966016

"Now the ſum of the momenta, divided by the ſum of the areas, will give $\frac{278613{\cdot}98966016}{7528{\cdot}7808} = 37{\cdot}006$ inches, the altitude of G, the centre of gravity of the ſection ABCD above the bottom. In like manner, the altitude of R, the centre of gravity of the ſection MMCD, will be found to be equal $\frac{123093{\cdot}98966016}{4936{\cdot}7808}$ = 24·934 inches; and conſequently their difference, or the value of GR = 12·072 inches will be found.

Suppoſe the veſſel to heel 15°, and we ſhall have the following proportion; namely, As radius : tangent of 15° : : MX = 54 inches : 14·469 inches = ME or MF; and conſequently the area of either triangle MXE or MXF = 390·663 ſquare inches. Therefore, by theorem 4th, as 4936·7808 : 390·663 : : 72 = *n n* = $\frac{2}{3}$ AB : 5·6975 inches = RT; and, again, as radius : ſine of 15° : : 12·072 = GR : 3·1245 inches = RN; conſequently RT—RN = 5·6975—3·1245 = 2·573 inches = SW, the ſtability required.

"Moreover, as the ſine of 15° : radius : : 5·6975 = RT : 22·013 = RS, to which, if we add 24·934, the altitude of the point R, we ſhall have 46·947 for the height of the metacentre, which taken from 72, the whole altitude, there remains 25·053; from which, and the half width = 54 inches, the diſtance BS is found = 59·529 inches very nearly, and the angle SBV = 80°—06′—42″; from whence SV = 58·645 inches.

Again: Let us ſuppoſe the mean length of the veſſel to be 40 feet, or 480 inches, and we ſhall have the weight of the whole veſſel equal to the area of the ſection MMCD = 4936·7808 multiplied by 480 = 2369654·784 cubic inches of water, which weighs exactly 85708 pounds avoirdupoiſe, allowing the cubic foot to weigh 62·5 pounds.

"And, finally, as SV : SW (*i. e.*) as 58·645 : 2·573 : : 85708 : 3760 +, the weight on the gunwale which will ſuſtain the veſſel at the given inclination. Therefore a veſſel of the above dimenſions, and weighing 38 tons, 5 cwts. 28 lbs. will require a weight of 1 ton, 13 cwts. 64 lbs. to make her incline 15°.

"In this example, the deflecting power has been ſuppoſed to act perpendicularly on the gunwale at B; but if the veſſel is navigated by ſails, the centre velique muſt be found; with which, and the angle of deflection, the projected diſtance thereof on the line SV may be obtained; and then the power, calculated as above, neceſſary to be applied at the projected point, will be that part of the wind's force which cauſes the veſſel to heel. And converſely, if the weight and dimenſions of the veſſel, the area and altitude of the ſails, the direction and velocity of the wind be given, the angle of deflection may be found."

FLORIDA, a townſhip in Orange co. New-York, 6 or 8 miles S. of Goſhen, and 50 N. W. of New-York city. 377 of its inhabitants are qualified to be electors. It has been lately incorporated.—*Morſe.*

Florida, *Eaſt* and *Weſt*, belonging to Spain, ſituated between 25. and 31. N. lat. and between 80. and 91. W. long. about 600 miles in length. Its breadth is various; the broadeſt part of Weſt Florida is about 130 miles, while the narrow peninſula of Eaſt Florida extends, in the ſame direction, from S. to N. 400 miles. It is bounded N. by Georgia, S. by the gulf of Mexico, E. by the Atlantic ocean, and W. by the Miſſiſſippi, pi, which ſeparates it from Louiſiana, and is nearly of the form of the letter L. Among its rivers that fall into the Atlantic, St. John's and Indian rivers are the chief. Seguana, Appalachicola, Chatahatchi, Eſcambia, Mobile, Paſcagoula and Pearl rivers all riſe in Georgia, and run ſoutherly into the gulf of Mexico. The principal bays are St Bernard's, Aſcenſion, Mobile, Penſacola, Dauphin, Joſeph, Apalachy, Spiritu Sancto; and the chief capes are Blanco, St Blaize, Anclote, and cape Florida at the extremity of the peninſula. The climate is little different from that of Georgia. There are, in this country, a great variety of ſoils; the eaſtern part of it, near to, and about St Auguſtine, is by far the moſt unfruitful; yet even there, two crops of Indian corn are annually produced. The banks of the rivers which water the Floridas, and the parts contiguous, are of a ſuperior quality, and well adapted to the culture of rice and corn. The fine lands near the river Eſcambia, are deſcribed under the account of that river. The interior country, which is high and pleaſant, abounds with wood of almoſt every kind; particularly white and red oak, live oak, laurel magnolia, pine, hickory, cypreſs, red and white cedar. The live oaks, though not tall, contain a prodigious quantity of timber. The trunk is generally from 12 to 20 feet in circumference, and riſes 10 or 12 feet from the earth, and then branches into 4 or 5 great limbs, which grow in nearly a horizontal direction, forming a gentle curve. "I have ſtepped" ſays Bartram, "above 50 paces, on a ſtraight line, from the trunk of one of theſe trees to the extremity of the limbs." They are ever green, and the wood almoſt incorruptible. They bear a great quantity of ſmall acorns, which is agreeable food when roaſted, and from which the Indians extract a ſweet oil, which they uſe in cooking homminy and rice.

The laurel magnolia is the moſt beautiful among the trees of the foreſt, and is uſually 100 feet high, though ſome are much higher. The trunk is perfectly erect, riſing in the form of a beautiful column, and ſupporting a head like an obtuſe cone. The flowers, which are on the extremity of the branches, are large, white, and expanded like a roſe, and are the largeſt and moſt complete of any yet known; when fully expanded, they are from 6 to 9 inches diameter, and have a moſt delicious fragrance. The cypreſs is the largeſt of the American trees. "I have ſeen trunks of theſe trees," ſays Bartram, "that would meaſure 8, 10 and 12 feet in diameter, for 40 and 50 feet ſhaft." The trunks make excellent ſhingles, boards, and other timber; and when hollowed, make durable and convenient canoes. The garden vegetables are in high perfection; the orange and lemon trees grow here, without cultivation, to a large ſize, and produce better fruit than in Spain and Portugal. The intervales between the hilly parts of this country are extremely rich. The principal town in Weſt Florida is Penſacola; in Eaſt Florida St Auguſtine.

The Spaniſh ſtrength in the Floridas, and Louiſiana, in 1790, was as follows, according to Mr Melford's account: Troops and levies at St Auguſtine and on St John's river, 400—St Marks, 100—Penſacola, 350—Mobile and Tombigbee, 150—at the Natchez, 200—Red river, 100—Illinois river, 300—in all 1600 men, called the Orleans or Louiſiana regiment.

The number of American families that have been Spaniſh ſubjects ſince 1783, amounts to 1720, viz. at Tenſau, near Mobile bay, 90—on Tombigbee river, 130—at the Natchez on the Miſſiſſippi, 1500. All the ſettlers in theſe diſtricts are under the immediate orders of the military commandants, and ſubject to martial law; with an appeal from ſtage to ſtage, up to the viceroy of Mexico. The property of the ſubject at his deceaſe is to be managed by the commandant, whoſe fees, by law, are enormous.

Until the year 1586 the continent of North-America went by the name of Florida. It received this name from John Ponee, becauſe when he landed in N. lat. 38. 8. in April 1513, he found the country there in full bloom. Florida has frequently changed maſters, belonging alternately to the French and Spaniards. Weſt-Florida, as far as Perdido river, was owned and occupied by the French; the remainder, and all Eaſt-Florida, by the Spaniards, previous to their being ceded to the Britiſh, at the peace of 1763. The Britiſh divided this country into E. and W. Florida. During the American war, both the Floridas were reduced by the Spaniards, and guarantied to the crown of Spain by the definitive treaty of 1783.—*ib.*

FLORIDA, CAPE, the ſouthernmoſt point of land of the peninſula of Eaſt-Florida. It is 100 miles N. of the iſland of Cuba. N. lat. 25. 20. W. long. 80. 20.—*ib.*

FLORIDA KEYS, or *Martyr's Iſlands*, a number of rocks and ſand banks, bounded W. by the gulf of Mexico, E. by that of Florida. The great ſand bank extends from the peninſula of Eaſt-Florida inward, to the gulf of Mexico, in the form of a hook; its W. point is divided from the bank called the Dry Tortugas, by Tortuga channel.—*ib.*

FLORIDA, GULF OF, is the channel between the peninſula of Florida and the Bahama iſlands, N. of the iſland of Cuba; and through which the Gulf Stream finds a paſſage, and runs to the N. E. along the American coaſt.—*ib.*

FLOWERTOWN, in Pennſylvania, is a ſmall village about 12 miles N. of Philadelphia, in Montgomery co.—*ib.*

FLUENT, or FLOWING QUANTITY, in the doctrine of fluxions, is the variable quantity which is conſidered as increaſing and decreaſing; or the fluent of a given fluxion, is that quantity whoſe fluxion being taken, according to the rules of that doctrine, ſhall be the ſame with the given fluxion. See FLUXIONS. *Encycl.*

FLUIDS, MOTION IN. See HYDROSTATICS and RESISTANCE OF FLUIDS, *Encycl.* and MOTION in this *Supplement*.

FLUSHING, a town in Queen's co. New-York, ſituated on the N. W. part of Long Iſland, and on the S. ſide of Hell Gate; 7 miles E. by N. of New-York city. It contains 1607 inhabitants; of whom 210 are qualified electors, and 340 are ſlaves.—*Morſe.*

FLUVANNA, a county of Virginia, bounded N. by Albemarle, N. E. by Louiſa, E. by Goochland, W. by Amherſt, and S. by Fluvanna or James river, which divides it from Buckingham. It is about 22 miles long, and 20 broad, and contains 3,921 inhabitants, including 1,466 ſlaves. There is great plenty of marble, both white and variegated with blue, red and purple veins, found here, on James river, at the mouth of Rockfiſh; where it forms a large precipice, overhanging a navigable part of the river.—*ib.*

FOGEDAR, the military governor of a ſubordinate diſtrict in India, who has ſometimes the additional office of collecting the revenues.

FOGGY *Cape*, on the N. W. coaſt of N. America, is ſituated on the S. eaſtern ſide of the peninſula of Alaſka, and W. of Kiſhtac iſland.—*Morse.*

FOGGY *Iſle*, on the ſame ſide of the peninſula as the above, lies a ſhort way S. by W. of Foggy Cape. —*ib.*

FOLIATE, a name given by ſome to a curve of the 2d order, expreſſed by the equation $x^3+y^3=axy$, being one ſpecies of defective hyperbolas, with one aſymptote, and conſiſting of two infinite legs croſſing each other, forming a ſort of leaf. It is the 42d ſpecies of Newton's Lines of the 3d Order.

FOLLOWFIELD, a townſhip in Waſhington co. Pennſylvania. Eaſt and Weſt Followfield are alſo two townſhips, in Cheſter co. Pennſylvania.—*Morse.*

FONSECA, GULF OF, lies in New-Spain on the Pacific ocean, 40 miles S. E. of the town of St Miguel, and about 290 miles N. W. of Cape Blanco, on the weſtern ſide of the gulf of Nicoya.—*ib.*

FONTAIN, BELLE, a ſettlement in the N. W. territory, ſituated on the E. ſide of the Miſſiſſippi, about 18 miles N. of St Phillips, and 23 below Cahokia.—*ib.*

FONT, or FONTE, STRAITS DE, lie on the N. W. coaſt of N. America, in N. lat. 54. 35. W. long. 9. 55. There is a large iſland in the middle of the entrance. This is thought to be the ſame ſtrait that De Fonte, a Spaniſh admiral, diſcovered in 1640, whoſe account of it has been long treated as fabulous. It has been ſeen by captains Gray and Ingraham, of Boſton.—*ib.*

FORALONES, in the iſland of Gunra, and coaſt of Peru, in S. America, are old walls of ſome ancient building in the time of the Yncas, which ſerve here as light-houſes for the ſhipping which ſail from Callao to Paita, on the S. Sea coaſt.—*ib.*

FORCER, in mechanics, is properly a piſton without a valve. For, by drawing up ſuch a piſton, the air is drawn up, and the water follows; then puſhing the piſton down again, the water, being prevented from deſcending by the lower valve, is forced up to any height above, by means of a ſide branch between the two.

FORDYCE (James, D. D.) ſo well known to ſerious readers by his ſermons to young women and other ſpecimens of pulpit eloquence, was born at Aberdeen in the year 1720. His father was a man much eſteemed, and held, more than once, the office of chief magiſtrate in his native city; and his mother was a woman of good ſenſe, amiable temper, and exemplary piety. This reſpectable pair had the ſingular felicity of tranſmitting ſuperior talents to almoſt every individual of a numerous family; of one of which, viz. David Fordyce, the reader will find ſome account in the *Encyclopædia.*

The ſubject of this memoir, who was their fourth ſon, acquired, as well as his brother, the rudiments of claſſical learning at the grammar ſchool of Aberdeen, whence he was removed to the Mariſchal college and univerſity in the ſame city. Having completed a regular courſe of ſtudy both in philoſophy and theology, he was licenſed, when very young, according to the forms of the church of Scotland, to be a preacher of the goſpel; and was ſoon afterwards preferred to the place of ſecond miniſter in the collegiate church of Brechin in the county of Angus. After remaining there for ſome years, he received a preſentation to the church of Alloa near Stirling; and though the inhabitants of that pariſh were prepoſſeſſed in favour of another miniſter whom they knew, and prejudiced againſt Mr Fordyce whom they did not know; ſo narrow minded and totally deſtitute of taſte was his colleague in Brechin, that he judged it expedient to hazard the conſequences of a removal. He was aware that he entered on his new charge under a conſiderable degree of popular odium; but he thought it more probable that he ſhould be able to overcome that odium, than conciliate the affections of a ſour fanatic. In this expectation he was not deceived. The prejudices of the good people in Alloa were very quickly removed, not more by the able and impreſſive manner in which he conducted the public ſervices of the Lord's day, than by the amiable and condeſcending ſpirit with which he performed the more private duties of viſiting and catechiſing in the different diſtricts of his pariſh; duties which, as they were wont to be performed by the Scotch clergy, contributed much more than preahing to the religious inſtruction of the lower claſſes of the people.

It was during his reſidence at Alloa that Mr Fordyce firſt diſtinguiſhed himſelf as an author by the ſucceſſive publication of the three following ſermons. The firſt, upon the eloquence of the pulpit, was annexed to "the Art of Preaching" by his brother David; the ſecond, upon the methods of promoting edification by public inſtitutions, was preached at the ordination of the Rev. Mr Gibſon miniſter of St Ninian's, a neighbouring pariſh, in the year 1754, and publiſhed, with the charge and notes in 1755; and the third, upon the deluſive and perſecuting ſpirit of popery, was preached the ſame year before the ſynod of Stirling and Perth; and being publiſhed, came very quickly to a ſecond edition. But the ſermon which moſt ſtrongly arreſted the attention, both of the audience before which it was delivered, and of the public to which, in 1760, it was given from the preſs, was that on the *folly, infamy, and miſery of unlawful pleaſure*, preached before the General Aſſembly of the Church of Scotland. The choice of ſuch a ſubject on ſuch an occaſion, excited the ſurpriſe of all his hearers, and tempted the younger part of them to ſmile at the very reading of the text; but this unſeaſonable mirth was ſoon converted into ſeriouſneſs. The picture exhibited in this ſermon is the work of a maſter; and we have been aſſured by a friend who heard it preached, that the ſpirit and elegance of the compoſition was ſo ſeconded by the ſolemnity and animation with which it was delivered, that it made a very ſtriking impreſſion, not only upon the more reſpectable part of the audience, but upon minds of noted levity: It raiſed indeed its writer's fame as a pulpit-orator to an unrivalled eminence among his brethren in Scotland.

About this time, and we believe in conſequence of this ſermon, Mr Fordyce received from the univerſity of Glaſgow a diploma, creating him Doctor in Divinity; and if there is yet any thing honourable in academical degrees, proſtituted as they have long been by an undiſtinguiſhing diſtribution, the honour could not have been conferred with greater propriety on any man in the church to which he then belonged.

In that church he did not long remain. Soon after the publication of this ſingular ſermon, and his conſequent acquiſition of academical honours, he accepted of an invitation from a ſociety of Proteſtant diſſenters, who had their place of meeting in Monkwell-ſtreet, London, to become colleague and ſucceſſor to their paſtor, who was then old and infirm, and who died indeed in the ſpace of a few months. This gave occaſion to the Doctor to diſplay his oratory once more both from the pulpit and the preſs in a ſermon on the death of Dr Lawrence. He was now ſole paſtor to the congregation of Monkwell-ſtreet; and preached for many years, with great powers of eloquence and fervor of piety, to an audience always crowded and often overflowing.

When a preacher obtains, with or without merit, an uncommon ſhare of popularity, a conſiderable proportion of his hearers will ever conſiſt of thoſe, who are guided in their choice rather by curioſity and faſhion, than by ſound judgment. The attachments of ſuch people are as capricious and variable as their minds; and they change their preacher as they change their dreſs, not from their own taſte, for in general they have none; but from the deſire of being where others are, of doing what others do, and of admiring what others admire. Dr Fordyce appreciated juſtly the value of ſuch men's approbation, and knew it eventually by experience; but he was more than compenſated for the loſs of hearers of this deſcription by the ſteady adherence of others, whoſe eſteem was moſt deſirable, becauſe it was grounded upon the dictates of a ſound underſtanding.

At laſt, about Chriſtmas 1782, when his health, which had long been declining, rendered it neceſſary, in his own opinion, and in the opinion of his phyſicians, to diſcontinue his public ſervices, he reſigned his charge in Monkwell-ſtreet, and retired to a villa in Hampſhire, in the neighbourhood of the Earl of Bute, who honoured him with his friendſhip, and to whoſe valuable library he had free acceſs. Afterwards he removed to Bath, where having, with Chriſtian patience, ſuffered much from an aſthmatic complaint, to which he had been ſubject for ſome years, on the 1ſt of October 1796 he expired without a groan.

Were we to hazard an opinion of Dr Fordyce's intellectual powers from ſuch a peruſal of his works as we muſt acknowledge to have been haſty, we would ſay that he was a man of genius rather than of judgment; that his imagination was the predominant faculty of his mind; and that he was better fitted, by an addreſs to the paſſions, to enforce the practice of virtue, than, by the exertions of his own underſtanding, to vindicate ſpeculative truth, or to detect the ſophiſtry of error. From this remark, we cannot be ſuſpected of a wiſh to leſſen his character in the public eſteem; for his talents, as they appear to us, are ſurely of more value to a preacher than thoſe which are perhaps better adapted to literary or ſcientific purſuits. In none of his work indeed do we perceive any evidence either of profound ſcience, or of various erudition; though we doubt not but thoſe works are every thing which their author intended them to be. Of his ſermons to young women, which have attracted moſt general notice, it would be preſumptuous in us to give a character; for though we ſat down many years ago to read them, we could not get through; and we have never made a ſecond attempt. As far as we can depend upon what we recollect of theſe far-famed diſcourſes, the cenſure paſſed on them by Mrs Wolſtoncraft ſeems to be juſt. Their author, however, was certainly qualified to excel, and actually did excel as a preacher. We have already mentioned with approbation three or four of his occaſional ſermons; but perhaps the fineſt ſpecimen of pulpit oratory which ever fell from his pen, is the charge which he delivered at the ordination of his ſucceſſor in the meeting of Monkwell-ſtreet. It is indeed one of the moſt valuable diſcourſes of the kind that we have ſeen, and ſhould be read with attention by every clergyman of every denomination, who wiſhes to diſcharge his duty with credit to himſelf and with advantage to his people.

The effect of Dr Fordyce's addreſſes from the pulpit was much heightened, not only by an action and an elocution, which he ſtudied with care and practiſed with ſucceſs; but by the figure of his perſon, which was peculiarly dignified, and by the expreſſion of his countenance, which was animated at all times, but animated moſt of all when lighted up by the ardor of his ſoul in the ſervice of God. By ſome of his hearers, it was obſerved that, on many occaſions, he ſeemed not merely to ſpeak, but to look conviction to the heart. His eye, indeed, was particularly bright and penetrating, and he had carefully attended to the effect which an orator may often produce upon an audience by the judicious uſe of that little, but invaluable organ.

With reſpect to his theological ſentiments, we are aſſured (A) they were in no extreme, but liberal, rational, and manly. He ſeems to have been untainted by that rage of innovation, which of late has ſo completely diſfigured the creed, as well religious as political, of the great body of Engliſh diſſenters. The conſequence was, that he lived on terms of friendſhip with men of very oppoſite ſentiments; with Price a republican and Arian, and with Johnſon, who, though he hated a whig and a Preſbyterian, reſpected talents and worth wherever he found them.

We ſhall conclude this ſhort ſketch of Dr Fordyce's life and character with the following liſt of his works, of which ſome have been tranſlated into ſeveral languages. 1. A Sermon and Charge, at the ordination of the Rev. Mr Gibſon Miniſter of St Ninian's, 1754. 2. Another Ordination Sermon on the Eloquence of the Pulpit, annexed to his brother's "Art of Preaching," 1754. 3. A Sermon on the Spirit of Popery, 1754. 4. A Sermon on the Folly, Infamy, and Miſery of Unlawful Pleaſure, 1760. 5. A Sermon on the Death of Dr Lawrence, 1760. 6. Sermons to Young Women, 2 vols. 1765. 7. A Sermon on the

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(A) By his ſucceſſor in Monkwell-ſtreet, to whoſe ſermon, preached on occaſion of the Doctor's death, our readers are indebted for every thing valuable in this ſhort memoir.

Character and Conduct of the Female Sex, 1776. 8. Addreſſes to young men, 2 vols. 1777. 9. A Charge at the Ordination of the Rev. James Lindſey, in Monkwell-ſtreet, 1783. 10. Addreſſes to the Deity, 1785. 11. Poems, 1786. 12. A Diſcourſe on Pain, 1791. He alſo re-publiſhed, with an additional character, "The Temple of Virtue, a Dream," written by his brother David.

FORESTERTON, a village in Burlington co. New-Jerſey, which lies between Ayerſton and Eveſham; about 15 miles E. of Philadelphia, and 11 S. of Burlington city.—*Morſe.*

FOREST, a ſmall iſland in the Britiſh territories, at the mouth of Lake Ontario, between which and Grand Iſland is a narrow channel. It lies 9 miles ſoutherly of Fort Frontinac, and 6 N. weſterly of Roebuck iſland in the ſame lake, and within the line of the United States.—*ib.*

FORKED DEER, a navigable river in Tenneſſee, which runs weſterly into Miſſiſſippi river, between the Obian and Hatchy. It is about 76 yards wide, 7 miles from its mouth.—*ib.*

FORKS, a townſhip in Northampton co. Pennſylvania.—*ib.*

FORMULA, a theorem or general rule or expreſſion, for reſolving certain particular caſes of ſome problem, &c. So $\frac{1}{2}s+\frac{1}{2}d$ is a general formula for the greater of two quantities whoſe ſum is s and difference d; and $\frac{1}{2}s-\frac{1}{2}d$ is the formula, or general value, for the leſs quantity. Alſo $\sqrt{dx-x^2}$ is the formula, or general value, of the ordinate to a circle, whoſe diameter is d, and abſciſs x.

FORSTER (John Reinhold, L.L.D.) profeſſor of natural hiſtory in the univerſity of Halle, member of the academy of ſciences at Berlin, and of other learned ſocieties, was born at Dirſchau, in Weſt Pruſſia, in the month of October 1729, and was formerly a Proteſtant clergyman at Dantzick. He had a numerous family, and the emoluments of his office were ſlender. He therefore quitted Dantzick, and went, firſt to Ruſſia, and thence to England, in queſt of a better ſettlement than his own country afforded. In the diſſenting academy at Warrington he was appointed tutor in the modern languages, with the occaſional office of lecturing in various branches of natural hiſtory. For the firſt department he was by no means well qualified; his extraordinary knowledge of languages, ancient and modern, being unaccompanied by a particle of taſte; and his uſe of them being all barbarous, though fluent. As a natural hiſtorian, a critic, geographer, and antiquary, he ranked much higher; but, unfortunately, theſe were acquiſitions of little value in his academical department.

At length he obtained the appointment of naturaliſt and *philoſopher* (if the word may be ſo uſed) to the ſecond voyage of diſcovery undertaken by Capt. Cook; and from 1772 to 1775 he accompanied that immortal navigator round the world. On his return he reſided in London, till the improper conduct of himſelf and his ſon made it expedient for them both to leave the kingdom. Fortunately he received an invitation to Halle, where, for 18 years, he was a member of the philoſophical and medical faculties. Among his works are: An Introduction to Mineralogy, or, An accurate Claſſification of Foſſils and Minerals, &c. London, 1768, 8vo. A Catalogue of the Animals of North America, with ſhort Directions for collecting, preſerving, and tranſporting all kinds of Natural Curioſities, London, 1771, 8vo. Obſervations made during a Voyage round the World, on Phyſical Geography, &c. London, 1778. He was the author of a great many productions in Engliſh, Latin, or German, and of ſeveral papers in the Philoſophical Tranſactions. He tranſlated into Engliſh, Bougainville's Voyage round the World, and Kalm's, Boſſu's, and Reidſel's Travels. He was employed likewiſe, when in England, in the Critical Review; and he wrote various detached papers on different ſubjects, which have been inſerted in foreign journals and the tranſactions of learned academies.

He died at Halle on the 16th of December 1798, in the 70th year of his age.

FORSTER (George), the ſon of the preceding, was born at Dantzick, and accompanied his father to England when he was about twelve years of age. He was entered a ſtudent in the academy at Warrington, and ſoon acquired a very perfect uſe of the Engliſh tongue. He alſo diſtinguiſhed himſelf greatly by his attainments in ſcience and literature in general; adding to an excellent memory, quick parts and a fertile imagination. His temper was mild and amiable; in which he much differed from his father, one of the moſt quarrelſome and irritable of men; by which diſpoſition, joined to a total want of prudence in common concerns, he loſt almoſt all the friends his talents had acquired him, and involved himſelf and family in perpetual difficulties.

The caſe was very different with the ſubject of this memoir; for when Dr Forſter was appointed naturaliſt to captain Cook, his ſon, through the intereſt of the friends whom his good nature had made, was aſſociated with him in his office. The voyage continued during the ſpace of three years; and on their return the two Forſters publiſhed jointly a botanical work in Latin, contained the characters of a number of new *genera* of plants, diſcovered by them in their circumnavigation. Thus far they acted properly in the ſervice of government for the advancement of ſcience; but in publiſhing another work their conduct was not proper.

The father had come under an engagement not to publiſh ſeparately, from the authoriſed narrative, any account of the voyage; and this engagement he and his ſon were determined to violate. An account of the voyage, therefore, was publiſhed in Engliſh and German by *George;* and the language, which is correct and elegant, was undoubtedly his; but thoſe who knew both him and his father, are ſatisfied that the matter proceeded from the joint ſtock of their obſervations and reflections. Several parts of the work, and particularly the elaborate inveſtigations relative to the languages ſpoken by the natives of the South Sea Iſlands, and the ſpeculations concerning their ſucceſſive migrations, are thought to be ſtrongly impreſſed with the genius of the elder Forſter.

That a work thus ſurreptitiouſly uſhered into the world was not patroniſed by thoſe with whom the authors had ſo ungratefully broken faith, could excite no wonder, even though the publication itſelf had been otherwiſe unexceptionable; but this was far from being the caſe. It abounds with reflections injurious to the government whoſe ſervants they had been, and not juſt to the navigators employed on voyages of diſcovery. The younger Forſter, too, had ſome time before publiſhed a book replete with factious ſentiments; and the coldneſs with which he and his father were both treated in conſequence of ſuch conduct, determined them to leave London.

We have already related all that we know of the father, who was recommended to our notice only by his connection with the illuſtrious Cook; and of the ſon, there is a ſhort account in the Monthly Magazine, by Charles Pougens, fraught with thoſe impious and ſeditious reflections which ſo frequently diſgrace a miſcellany, which would otherwiſe be highly valuable. According to this author, George Forſter was deſirous to ſettle in France. Avaricious of glory, and an idolator of liberty, Paris was the city moſt ſuitable to his taſte and character of any in Europe. Notwithſtanding this, he was ſoon conſtrained to leave it: the intereſt of his family demanded this ſacrifice; for a learned man, who ſails round the world, may enrich his memory, but he will not better his fortune. He was accordingly obliged to accept the place of profeſſor of natural hiſtory in the univerſity of Caſſel. But his factious ſpirit accompanied him whitherſoever he went. It is well known, that the petty princes of Germany have long been in the practice of hiring out their troops to more opulent ſovereigns engaged in war. This practice, which we are not diſpoſed to defend, not only ſcandalized our Coſmopolite, but ſo irritated his temper and offended his pride, becauſe forſooth, the Prince of Heſſe-Caſſel would not by *him* be perſuaded to relinquiſh it, that he did every thing in his power, we are told, to withdraw himſelf from a ſituation ſo unſuitable to a thinking being. Every thing in his power! Did the Prince retain him in the univerſity contrary to his inclination? The univerſity of Caſſel muſt be contemptible indeed, if the prelections of ſuch a man as George Forſter were of ſuch conſequence to it.

He got away, however, and the ſenate of Poland having offered him a chair in the univerſity of Wilna, Forſter accepted of the invitation. But although this office was very lucrative, and the enlightened patriots of that country did not neglect to procure him all the literary ſuccours of which he ſtood in need, he could not be long happy in a ſemi-barbarous nation, in which liberty was ſuffered to expire under the intrigues of Ruſſia and Pruſſia.

On this, with wonderful conſiſtency, the man who could not endure the deſpotiſm of Heſſe, or even the ariſtocracy of England, accepted of the propoſitions of that friend to liberty Catharine II; who, jealous of every ſpecies of glory, wiſhed to ſignalize her reign, by procuring to the Ruſſian nation the honour of undertaking, after the example of England and France, a new voyage of diſcovery round the world. Unfortunately for the progreſs of knowledge, the war with the Ottoman Porte occaſioned the miſcarriage of this uſeful project.

But Forſter could not long remain in obſcurity. The different publications with which he occaſionally enriched natural hiſtory and literature, encreaſed his reputation. The Elector of Mentz accordingly appointed him preſident of the univerſity of the ſame name; and he was diſcharging the functions of his new office when the French troops took poſſeſſion of the capital. This philoſophical traveller, who had ſtudied ſociety under all the various aſpects ariſing from different degrees of civilization; who had viewed man ſimple and happy at Otaheite;—an eater of human fleſh in New-Zealand, corrupted by commerce in England, depraved in France by luxury and atheiſm, in Brabant by ſuperſtition, and in Poland by anarchy;—beheld with wild enthuſiaſm the dawnings of the French revolution, and was the firſt, ſays M. Pougens, to promulgate republicaniſm in Germany.

The *Mayencois*, who had formed themſelves into a national convention, ſent him to Paris, in order to ſolicit their *reunion* with the French republic. But, in the courſe of his miſſion, the city of Mentz was beſieged and retaken by the Pruſſian troops. This event occaſioned the loſs of all his property; and what was ſtill more diſaſtrous, that of his numerous manuſcripts, which fell into the hands of the Prince of Pruſſia.

Our biographer, after conducting his hero through theſe ſcenes of public life, proceeds to give us a view of his domeſtic habits and private principles. He tells us, that he formed a connection (whether a marriage or not, the ſtudied ambiguity of his language leaves rather uncertain) with a young woman named *Thereſa Hayne*, who, by the illumination of French philoſophy, had diveſted herſelf of all the prejudices which, we truſt, the ladies of this country ſtill conſider as their honour, as they are certainly the guardians of domeſtic peace. Miſs Hayne was indignant at the very *name of duty*. With Eloiſa ſhe had taken it into her head, that

> Love, free as air, at ſight of human ties,
> Spreads his light wings, and in a moment dies.

She was frank enough, however, ſays our author, to acknowledge the errors of her imagination; and from this expreſſion, and his calling her afterwards Forſter's wife, we are led to ſuppoſe that ſhe was actually married to him. But their union, of whatever kind, was of ſhort duration. Though the lady is ſaid to have been paſſionately attached to celebrated names, the *name* of George Forſter was not ſufficient to ſatisfy her. He ſoon ceaſed, we are informed, to *pleaſe* her; ſhe therefore transferred her affections to another; and, as was very natural for a woman who was indignant at the name of duty, ſhe proved falſe to her huſband's bed. Forſter, however, pretended to be ſuch a friend to the *modern* rights of men and women, that he defended the character of his Thereſa againſt crowds who condemned her conduct. Nay, we are told, that he conſidered himſelf, and every other huſband, who ceaſes to pleaſe, as the *adulterer of nature*. He therefore laboured ſtrenuouſly to obtain a divorce, to enable Thereſa Hayne to eſpouſe the man whom ſhe preferred to himſelf. Strange, however, to tell, the prejudices even of this Coſmopolite were too ſtrong for his principles. While he was endeavouring to procure the divorce, he made preparations at the ſame time, by the ſtudy of the oriental languages, to undertake a journey to Thibet and Indoſtan, in order to remove from that part of the world, in which both his heart and his perſon had experienced ſo ſevere a ſhock. But the chagrin occaſioned by his misfortunes, joined to a ſcorbutic affection,

tion, to which he had been long ſubject, and which he had contracted at ſea during the voyage of circumnavigation, abridged his life, and prevented him from realiſing this double project. He died at Paris, at the age of thirty-nine, on the 13th of February 1792.

This is a ſtrange tale; but we truſt it will not prove uſeleſs. The latter part of it at leaſt ſhows, that when men diveſt themſelves of the principles of religion, they ſoon degenerate from the dignity of philoſophers to the level of mere ſenſualiſts; and that the woman, who can, in defiance of decorum and honour, transfer her affections and her perſon from man to man, ranks no higher in the ſcale of being than a female brute of more than common ſagacity. It ſhews likewiſe, that the contempt of our modern ſages for thoſe partial attachments which unite individuals in one family, is a mere pretence; that the dictates of nature will be heard; and the laws of nature's God obeyed. George Forſter, though he was ſuch a zealous advocate for liberty and equality, as to vindicate the adultery of his wife; yet felt ſo ſenſibly the wound which her infidelity inflicted on his honour, that he could not ſurvive it, but periſhed, in conſequence, in the flower of his age.

Royal FORT, is one whoſe line of defence is at leaſt 26 fathoms long.

Star Fort, is a ſconce or redoubt, conſtituted by reentering and ſaliant angles, having commonly from five to eight points, and the ſides flanking each other.

FORT BALIZE, at the mouth of Miſſiſſippi river, lies 105 miles below the city of New-Orleans.—*Morse.*

Fort Blount, ſtands on Cumberland river, in the ſtate of Tenneſſee.—*ib.*

Fort Brewington, in New-York ſtate, is ſituated at the W. end of Oneida Lake, and on the N. ſide of Onondago river, at its mouth in the lake.—*ib.*

Fort Chartres, in the N. W. territory, is ſituated on the E. bank of Miſſiſſippi river, 6 miles W. by S. of St Phillips, and 19 W. N. W. of Kaſkaſkias village. —*ib.*

Fort Dauphin, a ſmall lake, or rather arm of Little Winnipeg lake, and weſt of it.—*ib.*

Fort Edward, a pleaſant village in Waſhington co. New-York, on the E. bank of Hudſon river, 49 miles N. of Albany. It has its name from the large fort built here in 1755; of which there are no remains but large mounds of earth.—*ib.*

Fort Anne, a village on the head-waters of Wood creek, in Waſhington co. New-York, 60 miles N. E. of Albany city. It has its name from a ſmall picket fort, erected in the reign of Queen Anne, of which there is no veſtige left.—*ib.*

Fort George, lies at the S. end of lake George, 62 miles N. of Albany. Here are the remains of the old forts, George, and William Henry. The ſituation is pleaſant, but there is hardly the appearance of a village.—*ib.*

Fortroyal, in the iſland of Grenada.—*ib.*

Fortroyal, one of the principal towns in the iſland of Martinico, in the Weſt-Indies. It is the ſeat of government in the iſland; its ſtreets are regular, the houſes agreeable, and the people gay and luxurious. The citadel which defends the town coſt the French £.325,000 ſterling. The harbor here is one of the beſt in the Weſt-Indies, and the ſhips of war winter in it. —*ib.*

FORTUNE, a large bay towards the S. W. part of Newfoundland iſland; acroſs the mouth of which lies Micklon iſland, and S. of it Peters iſland. This extenſive bay is interſperſed with ſmall iſles, and within it are many bays. It has great depth of water throughout.—*ib.*

FOSSIL-Meal, otherwiſe called *lac lunæ*, mineral argaric, and guhr, is, according the M. Fabbroni, a mixed earth, which exhales an argillaceous odour, and throws out a light whitiſh ſmoke when ſprinkled with water. It is abundant in Tuſcany, where it is employed for cleaning plate. It does not effervеſce with acids; is infuſible in the fire, in which it loſes an eighth part of its weight, though it becomes ſcarcely diminiſhed in bulk; and, according to the analyſis made by M. Fabbroni, conſiſts of the following component parts: ſiliceous earth 55, magneſia 15, water 14, argil 12, lime 3, iron 1. With this earth, which is found near Caſteldelpiano in the territories of Sienna, M. Fabbroni compoſed bricks, which, either baked or unbaked, floated in water. Hence he infers, that the floating bricks, which Pliny mentions as peculiar to Maſſilua and Calento, two cities in Spain, muſt have been made of foſſil-meal. Bricks made of that ſubſtance reſiſt water exceedingly well, and unite perfectly with lime; they are ſubject to no alteration either by heat or cold; and about a twentieth part of argil may be added with advantage to their compoſition, without depriving them of the property of floating. M. Fabbroni tried their reſiſtance, and found it very little inferior to that of common bricks; but it is much greater in proportion to their lightneſs. One of theſe bricks, ſeven inches in length, four and a half in breadth, and one inch eight lines in thickneſs, weighed only $14\frac{1}{4}$th ounces? whereas a common brick weighed 5 pounds $6\frac{3}{4}$ths ounces.

Bricks of foſſil-meal may be of important benefit in the conſtruction of reverberating furnaces, as they are ſuch bad conductors of heat, that a perſon may bring one half of them to a red heat, while the other is held in the hand. They may be employed alſo for buildings that require to be light; for conſtructing cooking places on board ſhips; and alſo floating batteries, the parapets of which, if made of theſe bricks, would be proof againſt red hot bullets; and, laſtly, for conſtructing powder magazines.

FOSTER, a townſhip in Providence co. Rhode-Iſland, containing 2268 inhabitants; 17 miles weſterly of Providence, and 31 N. W. of Newport.—*Morse.*

FOULAHS or **Foolahs**, a people in Africa, inhabiting a country on the confines of the great deſert (ſee Sahara in this *Suppl.*) along the parallel of nine degrees north. They partake much of the negro form and complexion; but have neither the *jetty* colour, *thick* lips, nor *criſped* hair of the negroes. They have alſo a language diſtinct from the Mandinga, which is the prevailing one in this quarter. The Foulah's occupy, at leaſt as ſovereigns, ſeveral provinces or kingdoms, interſperſed throughout the tract comprehended between the mountainous border of the country of Sierra Leona on the weſt, and that of Tombuctoo on the eaſt; as alſo a large tract on the lower part of the Senegal river; and theſe provinces are inſulated from each other in a very remarkable manner. Their religion is Mahomedaniſm; but with a great mixture of Paganiſm, and with leſs intolerance than is practiſed by the Moors.

The principal of the Foulah ſtates is that within Sierra Leona ; and of which Teemboo is the capital. The next in order appears to be that bordering on the ſouth of the Senegal river, and on the Jaloffs ; this is properly named Siratik. Others of leſs note are Bondou, with Foota-Torra adjacent to it, lying between the rivers Gambia and Falemé ; Foola-doo and Brooko along the upper part of the Senegal river ; Waſſela beyond the upper part of the Niger ; and Maſſina lower down on the ſame river, and joining to Tombuctoo on the weſt.

The kingdom of the Foulahs, ſituated between the upper part of the Gambia river, and the coaſt of Sierra Leona, and along the Rio Grande, is governed by a Mahometan ſovereign ; but the bulk of the people appear to be Pagans. From the circumſtances of their long hair, their lips, and comparatively light colour, Major Rennel is decidedly of opinion, that the Foulahs are the Leucæthiops of Ptolemy and Pliny. The former, as he obſerves, places the Leucæthiops in the ſituation occupied by the Foulahs ; and by the name which he gave them, he evidently meant to deſcribe a people *leſs* black than the generality of the Ethiopians. Hence it may be gathered, that this nation had been traded with, and that ſome notices reſpecting it had been communicated to Ptolemy. It may alſo be remarked, that the navigation of Hanno terminated on this coaſt; and as this was alſo the term of Ptolemy's knowledge, it may juſtly be ſuſpected, that this part of the coaſt was deſcribed from Carthaginian materials.

Thoſe who have peruſed the journal of Meſſrs Watt and Winterbottom through the Foulah country in 1794, and recollect how flattering a picture they give of the urbanity and hoſpitality of the Foulahs, will be gratified on finding that this nation was known and diſtinguiſhed from the reſt of the Ethiopians at a remote period of antiquity.

The contraſt between the Mooriſh and Negro characters is as great as that between the nature of their reſpective countries, or between their form and complexion. The Moors appear to poſſeſs the vices of the Arabs without their virtues ; and to avail themſelves of an intolerant religion, to oppreſs ſtrangers : whilſt the Negroes, and eſpecially the Mandingas, unable to comprehend a doctrine that ſubſtitutes opinion or belief for the ſocial duties, are content to remain in their humble ſtate of ignorance. The hoſpitality ſhewn by theſe good people to Mr Park, a deſtitute and forlorn ſtranger, raiſes them very high in the ſcale of humanity : and I know of no fitter title, ſays Mr Rennel, to confer on them than that of the *Hindoos of Africa ;* at the ſame time, by no means intending to degrade the Mahomedans of India by a compariſon with the African Moors.—See *Major Rennel's Geographical Illuſtrations of Mr Park's Journey, and of North Africa at large,* printed for the African Aſſociation.

FOXBOROUGH, a townſhip in Norfolk co. Maſſachuſetts, containing 674 inhabitants, 26 miles S. of Boſton. It was formerly a part of Dorcheſter, and was incorporated in 1778.—*Morse.*

FOX, a river in the N. W. territory, which riſes in the S. and runs about 50 miles N. where it approaches very near to, and parallel with, Ouiſconſin, a N. eaſtern branch of the Miſſiſſippi river. From the Great Carrying place here, through lake Winnebago, it runs eaſterly, then N. E. to bay Puan, about 180 miles. From the carrying place to Winnebago it is navigable for canoes 4 or 5 miles. From bay Puan its current is gentle ; from thence to Winnebago lake it is full of rocks and very rapid. Its breadth is between 70 and 100 yards. The land on its borders is good, thinly wooded with hickory, oak, and hazel.—*ib.*

Fox, a northern water of Illinois river, 34 miles below the mouth of Plein river.—*ib.*

FRAMINGHAM, a townſhip in Middleſex co. Maſſachuſetts, containing 1598 inhabitants. It was incorporated in 1700, and is 24 miles W. S. W. of Boſton.—*ib.*

FRANCAIS (PORT DES), the name given by Perouſe to a bay, or rather harbour, which he undoubtedly diſcovered on the north-weſt coaſt of America. It is ſituated, according to him, in 58° 37. N. Lat. and in 139° 50′ W. Long. from Paris. When the two frigates which he commanded approached it, as they were ſtretching along the coaſt from ſouth to north, he perceived from his ſhip a great reef of rocks behind which the ſea was very calm. This reef appeared to be about three or four hundred toiſes in length from eaſt to weſt, and to be terminated, at about two cables length, by the point of the continent, leaving a pretty large opening ; ſo that Nature ſeemed to have made, at the extremity of America, a harbour like that of Toulon, only more vaſt in her deſigns and in her means : this new harbour was three or four leagues deep.

Some officers, who had been diſpatched in boats to reconnoitre this harbour, gave a report of it extremely favourable ; and on the 3d of July 1786, the two frigates entered it, and anchored near its mouth in three fathoms and a half, rocky bottom. The bay, however, was quickly ſounded, and much better anchoring ground diſcovered at an iſland in the middle of it, where the ſhips might ride in 20 fathoms water with muddy bottom. This ground was taken poſſeſſion of, an obſervatory erected on the iſland, which was only a muſket ſhot from the ſhips, and a ſettlement formed for their ſtay in the harbour. From a report made by one of the officers who had penetrated towards the bottom of the bay, Perouſe had conceived the idea of finding perhaps a channel by which he might proceed into the interior of America ; but he was diſappointed. The bottom of the bay, indeed, according to him, is one of the moſt extraordinary places in the world. It is a baſon of water, of a depth in the middle that could not be fathomed, bordered by peaked mountains of an exceſſive height, covered with ſnow, without a blade of graſs upon this immenſe collection of rocks, condemned by Nature to perpetual ſterility. " I never (ſays he) ſaw a breath of air ruffle the ſurface of this water ; it is never troubled but by the fall of enormous pieces of ice, which continually detach themſelves from five different glaciers and which in falling make a noiſe that reſounds far in the mountains. The air is in this place ſo very calm, and the ſilence ſo profound, that the mere voice of a man may be heard half a league off, as well as the noiſe of ſome ſea birds which lay their eggs in the cavities of theſe rocks."

It was at the extremity of this bay that he was in hopes of finding a paſſage into the interior of America. He imagined that it might terminate in a great river, of which the courſe might lie between two mountains ;

and that this river might take its ſource in the great lakes to the northward of Canada. Two channels were indeed found, ſtretching, the one to the eaſt, and the other to the weſt; but both were very ſoon terminated by immenſe glaciers.

In Port des Français the variation of the compaſs is 28° eaſt, and the dip of the needle 74°. The ſea riſes there ſeven feet and a half at full and change of the moon, when it is high water at one o'clock. The ſea breezes, or perhaps other cauſes, act ſo powerfully upon the current of the channel, that M. Perouſe ſaw the flood come in there like the moſt rapid river; while, in other circumſtances, at the ſame period of the moon, it may be ſtemmed by a boat. In this channel he loſt two ſhallops and twenty men. In his different excurſions, he found the high water mark to be about 15 feet above the ſurface of the ſea. Theſe tides are probably incident to the bad ſeaſon. When the winds blow with violence from the ſouthward, the channel muſt be impracticable, and at all times the currents render the entrance difficult; the going out of it alſo requires a combination of circumſtances, which may retard the departure of a veſſel many weeks; there is no getting under way but at the top of high water; the breeze from the weſt to the north-weſt does not often riſe till toward eleven o'clock, which does not permit the taking advantage of the morning tide; finally, the eaſterly winds, which are contrary, appeared to him to be more frequent than thoſe from the weſt, and the vaſt height of the ſurrounding mountains never permits the land breezes, or thoſe from the north, to penetrate into the road.

As this port poſſeſſes great advantages, M. Perouſe thought it a duty incumbent on him to make its inconveniences alſo known. It ſeemed to him that this anchorage is not convenient for thoſe ſhips which are ſent out at a venture for trafficking in ſkins; ſuch ſhips ought to anchor in a great many bays, and always make the ſhorteſt ſtay poſſible in any of them; becauſe the Indians have always diſpoſed of their whole ſtock in the firſt week, and all loſt time is prejudicial to the intereſts of the owners; but a nation which ſhould form the project of eſtabliſhing factories ſimilar to thoſe of the Engliſh in Hudſon's Bay, could not make choice of a place more proper for ſuch a ſettlement. A ſimple battery of four heavy cannon, placed upon the point of the continent, would be fully adequate to the defence of ſo narrow an entrance, which is alſo made ſo difficult by the currents. This battery could not be turned or taken by land, becauſe the ſea always breaks with ſuch violence upon the coaſt, that to diſembark is impoſſible. The fort, the magazines, and all the ſettlements for commerce, ſhould be raiſed upon Cenotaph Iſland (A), the circumference of which is nearly a league: it is capable of being cultivated, and there is plenty of wood and water. The ſhips not having their cargo to ſeek, but being certain of having it collected to a ſingle point, would not be expoſed to any delay: ſome buoys, placed for the internal navigation of the bay, would make it extremely ſafe and eaſy. The ſettlement would form pilots, who, better verſed than we are in the ſet and ſtrength of the current at particular times of tide, would enſure the entrance and departure of the ſhips. Finally, continues the author, our traffic for otters ſkins has been ſo very conſiderable, that I may fairly preſume there could not, in any part of America, be a greater quantity of them collected.

The climate of this coaſt ſeemed to Perouſe much milder than that of Hudſon's Bay in the ſame latitude. Pines were meaſured of ſix feet diameter, and 140 high; while thoſe of the ſame ſpecies at Prince of Wales's Fort and Fort York are of a dimenſion ſcarce ſufficient for ſtudding ſail-booms. Vegetation is alſo very vigorous during three or four months of the year; and our author thinks, that Ruſſian corn, as well as many common plants might thrive exceedingly at Port des Français, where was found great abundance of celery, lupine, the wild pea, yarrow, and andive. Among theſe pot herbs were ſeen almoſt all thoſe of the meadows and mountains of France; ſuch as the angelica, the butter cup, the violet, and many ſpecies of graſs proper for fodder. The woods abound in gooſeberries, raſpberries, and ſtrawberries; cluſters of elder trees, the dwarf willow, different ſpecies of briar which grow in the ſhade, the gum poplar tree, the poplar, the ſallow, the horn-beam; and, finally, ſuperb pines, fit for the maſts of our largeſt ſhips. Not any of the vegetable productions of this country are unknown in Europe. M. de Martinière, in his different excurſions, met with only three plants which he thought new; and it is well known, that a botaniſt might do the ſame in the vicinity of Paris.

The rivers were filled with trout and ſalmon; and as the Indians ſold theſe fiſh to the French in greater quantities than they could conſume, they had very little fiſhing in the bay, and that only with the line. They caught ſome ling, a ſingle thornback, ſome plaice, *fletans* or *faitans*, of which ſome were more than 100 pounds in weight (B), and a fiſh reſembling the whiting, but a little larger, which abounds on the coaſt of Provence, where it is known by the name of *poor-prieſt*. Perouſe calls theſe fiſh *capelans*. In the woods they met with bears, martens, and ſquirrels; but they ſaw no great variety of birds, though the individuals were very numerous.

"If the animal and vegetable productions of this country reſemble thoſe of a great many others, its appearance (ſays our author) can be compared to nothing. The views which it preſents are more frightful than thoſe of the Alps and the Pyrenees; but at the ſame time ſo pictureſque, that they would deſerve the viſits of the curious, were they not at the extremity of the world. The primitive mountains of granite or ſchiſtus, perpetually covered with ſnow, upon which are neither trees nor plants, have their foundation in the ſea, and form upon the ſhore a kind of quay; their ſlope is ſo rapid, that after the firſt two or three hundred toiſes, the wild goats cannot climb them; and all

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(A) This name was given to the iſland in the bay from the monument erected on it to the memory of their unfortunate companions.

(B) This is a flat fiſh, longer and not ſo ſquare as the turbet. Its back is covered with ſmall ſcales; and thoſe which are taken in Europe are much leſs than the fletans of Port des Français.

the gullies which ſeparate them are immenſe glaciers, of which the tops cannot be diſcerned, while the baſe is waſhed by the ſea. At a cable's length from the land there is no bottom at leſs than 160 fathoms. The ſides of the harbour are formed by ſecondary mountains, the elevation of which does not exceed from 800 to 900 toiſes; they are covered with pines, and overſpread with verdure, and the ſnow is only ſeen on their ſummits: they appeared to be entirely formed of ſchiſtus, which is in the commencement of a ſtate of decompoſition; they are extremely difficult to climb, but not altogether inacceſſible.

"Nature aſſigns inhabitants to ſo frightful a country, who as widely differ from the people of civilized countries as the ſcene which has juſt been deſcribed differs from our cultivated plains; as rude and barbarous as their ſoil is rocky and barren, they inhabit this land only to deſtroy its population: at war with all the animals, they deſpiſe the vegetable ſubſtances which grow around them. I have ſeen (ſays our author) women and children eat ſome raſpberries and ſtrawberries; but theſe are undoubtedly viands far too inſipid for men, who live upon the earth like vultures in the air, or wolves and tigers in the foreſts.

"Their arts are ſomewhat advanced, and in this reſpect civilization has made conſiderable progreſs; but that which ſoftens their ferocity, and poliſhes their manners, is yet in its infancy. The mode of life they purſue excluding all kind of ſubordination, they are continually agitated by fear or revenge; prone to anger, and eaſily irritated, they are continually attacking each other dagger in hand. Expoſed in the winter to periſh for want, becauſe the chaſe cannot be ſucceſsful, they live during the ſummer in the greateſt abundance, as they can catch in leſs than an hour a ſufficient quantity of fiſh for the ſupport of their family; they remain idle during the reſt of the day, which they paſs at play, to which they are as much addicted as ſome of the inhabitants in our great cities. This gaming is the great ſource of their quarrels. If to all theſe deſtructive vices they ſhould unfortunately add a knowledge of the uſe of any inebriating liquor, M. Perouſe does not heſitate to pronounce, that this colony would be entirely annihilated."

Like all other ſavages, they are incorrigible thieves; and when they aſſumed a mild and placid appearance, the Frenchmen were ſure that they had ſtolen ſomething. Iron, of which they appeared to know the uſe, and of courſe the value, moſt excited their cupidity; and when our navigators were engaged in careſſing a child, the father was ſure to ſeize the opportunity of taking up, and concealing under his ſkin-garment, every thing of that metal which lay within his reach, and was not too heavy to be carried off.

M. Rollin, ſurgeon major of one of the frigates, thus deſcribes theſe people. "They have very little ſimilarity to the Californians; they are taller, ſtouter, of a more agreeable figure, and greater vivacity of expreſſion: they are alſo much their ſuperiors in courage and ſenſe. They have rather a low forehead, but more open than that of the Southern Americans; their eyes are black and very animated; their eyebrows much fuller; their noſe of the uſual ſize, and well formed, except being a little widened at the extremity; their lips thinner; their mouth moderately large; their teeth fine and very even; their chin and ears very regular.

"The women alſo have an equal advantage over thoſe of the preceding tribes; they have much more mildneſs in their features, and grace in their limbs— Their countenance would be even very agreeable, if, in order to ſet it off, they did not make uſe of a ſtrange cuſtom of wearing in the lower lip an elliptical piece of wood, lightly grooved on its circumference and both its ſides, and which is commonly half an inch thick, two in diameter, and three in length.

"This ſingular ornament, beſides being a great deformity, is the cauſe of a very troubleſome as well as diſguſting involuntary flow of ſaliva. This appendage is peculiar to the women; and female children are made to undergo the preparatory operations from the time of their birth. For this purpoſe, the lower lip is pierced with a kind of pin of copper or gold, which is either left in the opening, or its place ſupplied with a ring of the ſame material, till the period of puberty. The aperture is then gradually enlarged, by ſubſtituting firſt a ſmall piece of wood of the form mentioned above, then a larger one; and ſo on, increaſing its ſize by degrees till it reaches the dimenſions juſt ſtated.

"This extraordinary cuſtom ſhows the great power of dilatation in the lip, and may encourage medical practitioners in their attempts to remedy deformities of this part by the uſe of the knife.

"The general colour of theſe people is olive, a fainter tinge of which is apparent in their nails, which they ſuffer to grow very long; the hue of the ſkin, however, varies in different individuals, and in various parts of the ſame individual, according to their expoſure to the action of the air and ſun.

"Their hair is, in general, neither ſo coarſe nor black as that of the South Americans. Cheſnut coloured hair is by no means unfrequent among them. Their beard is alſo fuller, and their armpits and parts of ſex better provided with hair.

"The perfect evenneſs of their teeth led me at firſt to ſuſpect that it was the effect of art; but after an attentive and minute examination, I could perceive no wearing away of the enamel, and I ſaw that this regularity is natural. They tattoo and paint their face and body, and bore their ears and the cartilage of their noſe.

"Some writers have imagined, that the cuſtom of painting the face and body, ſo generally adopted by the Africans, Americans, and Weſt-Indians, is only intended as a preſervative againſt noxious inſects. I think, however, that I am warranted in aſſerting its ſole end to be ornament. I found it to prevail among the inhabitants of Eaſter Iſland and the natives of *Port des Français* without obſerving among them either venomous inſects or reptiles. Beſides, I remarked, that they wore paint only when they paid us a viſit; for they made no uſe of it when in their own houſes."

M. Perouſe himſelf ſpeaks not ſo favourably of the women as M. Rollin. "They are (he ſays) the moſt diſguſting of any on the earth, covered with ſtinking ſkins, which are frequently untanned; and yet they failed not to excite deſires in ſome perſons, in fact of no ſmall conſequence: they at firſt ſtarted many difficulties, giving aſſurances by their geſtures that they ran the riſk of their lives; but being overcome by preſents,

ſents, they had no objection to the ſun being a witneſs, and abſolutely refuſed to retire into the wood." There can be no doubt that this planet is the god of theſe people, ſince they frequently addreſſed themſelves to it in their prayers ; but our voyagers ſaw neither temple nor prieſt, nor the leaſt trace of public worſhip at ſtated times. They burn their dead.

FRANCESTOWN, an interior townſhip in Hillſborough co. New-Hampſhire, on the E. ſide of Contecook river, about 21 miles to the S. W. of Concord. It was incorporated in 1772, and contained in 1775, 200 inhabitants, in 1790, 982.—*Morſe.*

FRANCISBOROUGH, a ſettlement in York co. diſtrict of Maine, containing 311 inhabitants.—*ib.*

FRANCIS, St a lake, or extenſion of the river St Lawrence, between Kingſton and Montreal, through which paſſes the line dividing Upper from Lower Canada.—*ib.*

Francis, St a river in the province of Lower Canada, which riſes from lake Memphremagog, and runs northward into the river St Lawrence. It is not all the way navigable; elſe it would afford an important communication from the northern parts of Vermont to the markets of Montreal and Quebec.—*ib.*

Francis, St a ſmall river in Louiſiana, which runs a S. E. courſe into the Miſſiſſippi, 108 miles above Arkanſas river, and 70 miles above Margot river, on the E. ſide of the Miſſiſſippi. It is remarkable for nothing but the general rendezvous for the hunters from New-Orleans, who winter there, and collect ſalt meat, ſuet, and bear's oil, for the ſupply of that city. Kappas Old fort formerly ſtood at the mouth of this river, on the ſouthern ſide. It was built by the French during their wars with the Chickaſaw Indians.

Alſo, the name of a ſmall river in the N. W. territory, which runs a S. W. by W. courſe into Miſſiſſippi, between Cold and Rum rivers, 60 miles above St Anthony's Falls. The country a little above it is hilly, and the ſoil pretty good. To the N. E. are the ſmall lakes called the Thouſand lakes. The Miſſiſſippi here is not above 90 yards wide.—*ib.*

Francis, St in Brazil, S. America, a long and large river which runs N. eaſterly, and thence S. E. till it empties into the ocean, N. E. of the town of Seregeppe del Rey. It has a number of towns and ſettlements, chiefly on its head waters.—*ib.*

FRANCOIS, Cape St a juriſdiction, city, and port in the N. weſtern part of the iſland of St Domingo. This juriſdiction is in the North diviſion of the iſland, in what was called the French part of it; and contains 13 pariſhes. Its exports from Jan. 1, 1789, to Dec. 31, of the ſame year, were as follow: 31,187,636lb. white ſugar, 7,267,531lb. brown ſugar, 32,545,524lb. coffee, 269,240lb. cotton, 245,177lb. indigo; tanned hides, molaſſes, ſpirits, &c. to the value of 21,789 livres. Total value of duties on exportation, 253,590 dollars, 37 cents. Cape François exceeds Port au Prince in the value of its productions, the elegance of its buildings, and the advantageous ſituation of its port. The city, which is the governor's reſidence in time of war, is ſituated on a cape at the edge of a large plain, 20 leagues long, and on an average 4 broad, between the ſea and the mountains. There are few lands better watered, but there is not a river that will admit a ſloop above 3 miles. This ſpace is cut through by ſtraight roads, 40 feet broad, uninterruptedly lined with hedges of lime and lemon trees, intermixed with long avenues of lofty trees, leading to plantations which produce a greater quantity of ſugar than any ſpot of the ſame ſize in the world. The town, which is ſituated in the moſt unhealthy place of this extenſive and beautiful plain, had, ſome years ſince, ſeveral elegant public buildings, as the governor's houſe, the barracks, the magazine, and two hoſpitals, called the *houſes of Providence,* founded for the benevolent and humane purpoſe of ſupporting thoſe Europeans who came thither without money or merchandize. The harbour is admirably well ſituated for ſhips which come from Europe, being only open to the N. from whence ſhips receive no damage, its entrance being ſprinkled over with reefs that break the force of the waves. Before its deſtruction in 1793, this city contained about 8000 inhabitants; whites, people of colour, and ſlaves.—*ib.*

Francois, Old Cape, the north-eaſternmoſt point of the iſland of St Domingo or Hiſpaniola; having Balſamo bay N. W. and Scotch bay S. S. E.—*ib.*

FRANCONIA, a townſhip in Grafton co. New-Hampſhire, 14 miles N. E. of Haverhill (N. H.) on Connecticut river. Incorporated in 1764, firſt called Morriſtown. It contains 72 inhabitants.—*ib.*

FRANKFORT, a townſhip in Hancock co. diſtrict of Maine, on the W. ſide of Penobſcot bay. It has a few houſes, regularly built, and lies 8 miles W. of Penobſcot, 123 W. of Paſſamaquoddy, and 238 N. E. of Boſton. The townſhip contains 891 inhabitants.—*ib.*

Frankfort, or *Frankford,* a pleaſant, thriving village, in Philadelphia co. Pennſylvania, ſeated on the N. E. ſide of a creek of the ſame name, a mile and an half from Delaware river. It contains about 50 houſes, chiefly of ſtone, an Epiſcopal and a German church; on elevated ground, about 5 miles N. E. of Philadelphia.—*ib.*

Frankfort, a new townſhip in Herkemer co. New-York, E. of Whiteſtown, adjoining.—*ib.*

Frankfort, a thriving village in Hampſhire co. Virginia, on a creek which empties into Potowmack river. It is 13 miles N. W. of Rumney, 4 miles S. of the Potowmack, and 10 S. S. E. of Fort Cumberland.—*ib.*

Frankfort, the capital of Pendleton co. Virginia, is ſituated on the W. ſide of a S. branch of Potowmack river. It contains a court-houſe, gaol, and about 30 houſes; 180 miles N. W. of Richmond.—*ib.*

Frankfort, the metropolis of Kentucky, is ſituated in Franklin co. on the N. E. bank of Kentucky river, about 50 miles from its confluence with the Ohio. It is a flouriſhing town, regularly laid out, and has a number of handſome houſes. The ſtate-houſe is a handſome ſtone building. Here is alſo a tobacco warehouſe. It is 30 miles N. of Harrodſburg, 40 N. by W. of Danville, 123 from Louiſville, and 790 W. by S. of Philadelphia. N. lat. 38. 14. W. long. 95. 28.—*ib.*

FRANKLIN (Dr Benjamin), the celebrated American philoſopher and ſtateſman, was born at Boſton in 1706 of reſpectable, but not wealthy parents. The promptitude with which, from his infancy, he had learned to read was ſuch, that he ſaid he did not remember to have been ever without this acquirement.

Franklin.

At eight years of age he was ſent to a grammar ſchool, his father having intended him for the church, but contemplating the expence of a collegiate education, recalled him, within a year, and ſent him to learn arithmetic and writing: he ſoon wrote well, but made no progreſs in arithmetic. At ten he was called home to aſſiſt his father in his buſineſs of ſoap boiler and tallow chandler, a buſineſs which he diſliked, and two years afterwards was bound apprentice to his brother who was a printer. In this employment he made great proficiency, and having acceſs to more books than formerly, he devoted much of his leiſure time to reading. He acknowledged that the peruſal of Shafteſbury and Collins made him a ſceptic completely, having been previouſly ſo with reſpect to many doctrines of chriſtianity, and that he found the Socratic mode of reaſoning enabled him to embarraſs even perſons of ſuperior underſtanding, and to obtain for him victories which neither his cauſe nor his arguments merited. During his apprenticeſhip he wrote ſeveral pieces for the newſpaper which were approved, but kept himſelf unknown. After frequent diſputes with his brother, he determined to leave Boſton, where in conſequence of his indiſcreet diſputes about religion he had begun to be looked upon by pious men with horror as an apoſtate or an atheiſt. He privately got on board a ſloop and ſoon arrived in New-York, where he applied for employment to Mr Bradford, who could not employ him, but adviſed him to go to Philadelphia, where after a very unpleaſant and dangerous journey he at laſt arrived, and with ſome difficulty got employment with one Keimer, with whom he continued for ſome time, till by the advice of Sir William Keith, then governor of Pennſylvania, he ſailed for England, where he arrived in 1724. Diſappointed by not having letters of recommendation from the governor, he applied for and obtained employment as a journeyman Printer, where he improved his knowledge and ſaved ſome money. Here he publiſhed his Diſſertation on Liberty and neceſſity, and aſſociated with Lyons, Mandeville and others of that claſs. After nearly two years reſidence in London he returned to Philadelphia with a Mr Denham as his clerk and aſſiſtant in a ſtore. On Mr Denham's death Franklin returned to Keimer in capacity of foreman, which continued with little interruption till he ſet up a printing-office himſelf. In this period of the hiſtory of his life written by himſelf he gives the following ſtatement of his principles.

"Before I relate the particulars of my entrance into buſineſs, it may be proper to inform you what was at that time the ſtate of my mind as to moral principles, that you may ſee the degree of influence they had upon the ſubſequent events of my life.

My parents had given me betimes religious impreſſions; and I received from my infancy a pious education in the principles of Calviniſm. But ſcarcely was I arrived at fifteen years of age, when, after having doubted in turn of different tenets, according as I found them combated in the different books that I read, I began to doubt of revelation itſelf. Some volumes againſt deiſm fell into my hands. They were ſaid to be the ſubſtance of ſermons preached at Boyle's lecture. It happened that they produced on me an effect preciſely the reverſe of what was intended by the writers; for the arguments of the deiſts, which were cited in order to be refuted, appeared to me much more forcible than the refutation itſelf. In a word, I ſoon became a perfect deiſt. My arguments perverted ſome other young perſons; particularly Collins and Ralph. But in the ſequel, when I recollected that they had both uſed me extremely ill, without the ſmalleſt remorſe; when I conſidered the behaviour of Keith, another freethinker, and my own conduct towards Vernon and Miſs Read, which at times gave me much uneaſineſs, I was led to ſuſpect that this doctrine, though it might be true, was not very uſeful. I began to entertain a leſs favourable opinion of my London pamphlet, to which I had prefixed, as a motto, the following lines of Dryden;

> Whatever is, is right; tho' purblind man,
> Sees but part of the chain the neareſt link,
> His eyes not carrying to the equal beam
> That poiſes all above.

and of which the object was to prove, from the attributes of God, his goodneſs, wiſdom, and power, that there could be no ſuch thing as evil in the world; that vice and virtue did not in reality exiſt and were nothing more than vain diſtinctions. I no longer regarded it as ſo blameleſs a work as I had formerly imagined; and I ſuſpected that ſome error muſt have imperceptibly have glided into my argument, by which all the inferences I had drawn from it had been affected as frequently happens in metaphyſical reaſonings. In a word, I was at laſt convinced that truth, probity, and ſincerity, in tranſactions between man and man, were of the utmoſt importance to the happineſs of life; and I reſolved from that moment, and wrote the reſolution in my journal, to practiſe them as long as I lived.

Revelation indeed, as ſuch, had no influence on my mind; but I was of opinion that, though certain actions could not be bad merely becauſe revelation prohibited them, or good becauſe it enjoined them, yet it was probable that thoſe actions were prohibited becauſe they were bad for us, or enjoined becauſe advantageous in their nature, all things conſidered. This perſuaſion, Divine Providence, or ſome guardian angel, and perhaps a concurrence of favourable circumſtances co-operating, preſerved me from all immorality, or groſs and *voluntary* injuſtice, to which my want of religion was calculated to expoſe me, in the dangerous period of youth and in the hazardous ſituations in which I ſometimes found myſelf, among ſtrangers, and at a diſtance from the eye and admonitions of my father. I may ſay *voluntary*, becauſe the errors into which I had fallen, had been in a manner the forced reſult either of my own inexperience, or the diſhoneſty of others. Thus, before I entered on my new career, I had imbibed ſolid principles, and a character of probity. I knew their value; and I made a ſolemn engagement with myſelf never to depart from them."

He now began buſineſs in partnerſhip with Mr Meredith which laſted till 1729, when Franklin took the whole buſineſs into his own hands. In the mean time he had united the majority of well informed perſons of his acquaintance into a club, known by the name of the *Junto*, for the purpoſe of mutual improvement, which met every Friday evening to conſider queſtions of morality, politicks, or philoſophy, which became a very uſeful inſtitution and which continued almoſt forty years. On entering into buſineſs by himſelf he found himſelf in embarraſſed circumſtances from which he was relieved by the generous aſſiſtance of William Coleman and Robert Grace, whoſe kindneſs made a deep impreſſion on his mind. He now opened a ſmall ſtationer's ſhop, was induſtrious, ſteady, and ſucceſsful, and in 1730 he married the daughter of Mr Read, who was now a widow. Having had frequent occaſion to quote books in the club, he ſtarted the idea of eſtabliſhing a public library, which was carried into effect in 1731 and became the foundation of that noble inſtitution which was incorporated in 1742, and now does honour to the city of Philadelphia. This inſtitution was greatly encouraged by the friends of literature in America and in Great Britain. The Penn family diſtinguiſhed themſelves by their donations, and the late Peter Collinſon, beſides liberal donations from himſelf and obtained from others, voluntarily undertook to manage the buſineſs of the company in London for which his extenſive knowledge and zeal for the promotion of ſcience eminently qualified him, recommending ſuitable books, purchaſing, and ſhipping them for thirty years, which he communicated to the directors every improvement and diſcovery in the arts, agriculture and philoſophy.

In 1732 Franklin began to publiſh Poor Richard's Almanack, remarkable for numerous and valuable conciſe maxims, tending to promote induſtry, and frugality: the demand for it was ſuch that 10,000 have been ſold in one year. Theſe maxims have been collected in an addreſs entitled, The Way to Wealth, which has appeared in various publications.

In 1736 Franklin was choſen clerk to the General Aſſembly of Pennſylvania, and in 1737 he was appointed poſt-maſter: in 1738 he formed the firſt Fire Company in Philadelphia, and ſome time after ſuggeſted the plan of an aſſociation for inſuring houſes from loſs by fire, which has been a very valuable inſtitution.

In 1744, during a war between France and Britain, ſome French and Indians had made inroads upon the frontiers of Pennſylvania, whoſe inhabitants were unprovided for ſuch an attack. The governor recommended to the Aſſembly to paſs a militia law, but owing to ſome diſputes between the governor and Aſſembly it was not done, the ſituation of the Province was alarming, and deſtitute of the means of defence. At this criſis Franklin ſtepped forth and propoſed to a meeting of the citizens of Philadelphia, a voluntary aſſociation for the defence of the Province. This was approved of and ſigned by 1200 perſons immediately, and in a ſhort time the number increaſed to 10,000. Franklin was choſen colonel of the Philadelphia regiment but choſe to decline the honour.

In the year 1745 Mr Collinſon ſent to the Library Company of Philadelphia an account of the experiments in electricity which had at that time engaged the attention of the philoſophers in Europe. Mr Kinnerſley and others applied themſelves to the ſubject, and Franklin ſoon made a diſtinguiſhed figure in this courſe, his experiments and diſcoveries are ſo numerous, and ſo well known as to render an account of them in this place ſuperfluous. The practical uſe of his diſcoveries in the application of pointed conductors for the purpoſe of ſecuring houſes from injury by lightning is well known and in general uſe in America, and in many places in Europe.

In 1747 he became a member of the General Aſſembly of Pennſylvania, where his influence was very conſiderable. He ſeldom ſpoke, and never attempted oratory, but frequently by a ſingle obſervation determined the fate of a queſtion. Perceiving that the beſt way of ſecuring permanently the rights of the people was, by the general diffuſion of knowledge and information to all claſſes, he drew up a plan of an Academy to be erected in the city of Philadelphia, not only adapted to an infant colony, but alſo as a foundation on which poſterity might erect a more extenſive ſeminary. The conſtitution was drawn up and ſigned in 1749, and in 1750 the Latin and Greek, Mathematical and Engliſh ſchools were opened, and a Charity ſchool for 60 boys and 30 girls. This inſtitution was incorporated in 1753, and an additional charter was obtained in 1755. In 1752 he had joined in the ſcheme ſuggeſted by Dr Bond, and on application to the Aſſembly obtained from the public £.2000 for eſtabliſhing the Hoſpital for the poor when viſited by diſeaſe. In 1753 he was appointed deputy poſt-maſter general for the Britiſh Colonies, and in his hands this department was ſo well adminiſtered that its annual produce was ſaid to be more than double that of Ireland.

In 1754 Franklin, as commiſſioner from Pennſylvania, met at Albany with the commiſſioners of ſeveral of the other colonies, and produced a plan which has been called the Albany Plan of Union for the defence and general government of the colonies. After ſeveral days diſcuſſion it was unanimouſly agreed to, and a copy of it tranſmitted to each colonial Aſſembly, and one to the king's Council. The fate of it was ſingular: it was rejected by the miniſtry of Great Britain, becauſe it gave too much power to the repreſentatives of the people, and it was rejected by all the aſſemblies as giving to the preſident general, the repreſentative of the Crown, an influence greater than appeared to them proper in a plan of government intended for freemen.

The defeat of Braddock ſpread a very great alarm through the colonies. Franklin introduced into the Aſſembly a bill for organizing a militia, the bill paſſed and he was appointed colonel of a regiment in Philadelphia of 1200 men; the frontier being invaded, he repaired by order of the governor, with a body of men, to the place at which their preſence was neceſſary, built a fort, and placed a garriſon in ſuch a poſture as to withſtand the inroads to which the inhabitants had been expoſed. In 1757 he was appointed agent for the province of Pennſylvania to preſent to the king a petition for redreſs from the attention of the proprietaries to their private intereſt, who would not conſent that their eſtates ſhould be taxed to bear a ſhare of the public burdens. Agreeably to the inſtructions which he had received from the legiſlature he endeavoured to prevail on the proprietaries to give up the point in conteſt, finding them obſtinate, he laid his petition before the council, where after much oppoſition it was agreed that the proprietary eſtates ſhould pay their due proportion of taxes on Mr Franklin engaging that their burdens ſhould not exceed the due proportion. After tranquillity had been re-eſtabliſhed by his abilities and integrity as agent for Pennſylvania, his extenſive knowledge of the ſituation of the colonies occaſioned his appointment as agent for Maſſachuſetts, Maryland, and Georgia, in which ſituation his conduct rendered him dear to his countrymen. He had now the rewards of literary and philoſophical merit abundantly beſtowed on him, by being admitted fellow of many learned ſocieties. The degree of Doctor of Laws was conferred on him by the Univerſities of St Andrews, Edinburgh, and Oxford, and his correſpondence ſought for by the moſt eminent philoſophers of Europe. During this period he ſhewed in a pamphlet the advantages which would accrue from the conqueſt of Canada, which was ſhortly after accompliſhed. He continued his philoſophical reſearches and experiments with great ſucceſs, and after a variety of experiments on Mr Puckeridge's diſcoveries he formed that elegant inſtrument which he called the Harmonica, and in his return in 1762, obſerved the effect of oil on the ſurface of the ocean.

Having received the thanks of the Aſſembly of Pennſylvania, and a vote of £.5000 for his ſervices, he reſumed his ſeat as a member of that body, with as much popularity as before.

In 1764 he was again ſent to London as provincial agent, and in 1766 was examined at the bar of the Houſe of Commons reſpecting the repeal of the ſtamp act. The ſame year he viſited Holland and Germany, where he was well received by men of ſcience, as he was alſo in France in the following year. Several letters from Hutchinſon, Oliver and others came into the hands of Dr Franklin, containing violent invectives againſt the leading characters in Maſſachuſetts, and ſtrenuouſly adviſing vigorous meaſures to compel the people to obedience, theſe he ſent to the legiſlature, by whom they were publiſhed, atteſted copies were ſent to Great Britain, with a petition to the king to remove the writers from office. Dr Franklin declared that he had ſent the letters, but refuſed to give information of the manner in which they came to his hands; the petition was rejected. The meaſures which the miniſtry purſued in laying taxes on the colonies Dr Franklin uſed his utmoſt endeavours to induce them to change but without ſucceſs, and finding all his efforts to reſtore harmony uſeleſs he returned to America in 1775. Juſt after the commencement of hoſtilities, he viſited Canada to perſuade the citizens to join in the common cauſe, but did not ſucceed. In 1776 he was joined with Mr Adams and Mr Rutledge to learn the extent of the powers of thoſe commiſſioners who came with Lord Howe, but finding that they were only empowered to grant pardons on ſubmiſſion, nothing could be done. He gave his voice decidedly for independence, and had great influence in bringing over others to the ſame views. The public mind had been in ſome meaſure prepared for this by Paine's pamphlet *Common Senſe:* there was good reaſon to believe that Dr Franklin had a conſiderable ſhare in this work. The ſame year he was choſen preſident of the Convention which met in Philadelphia to form a new conſtitution for Pennſylvania. In the latter end of the year he was appointed to aſſiſt in the negociations which had been ſet on foot in France by Silas Deane, but nothing could be accompliſhed till the news of the capture of Burgoyne's army by the Americans decided the conduct of France: to this alſo was owing the facility with which loans in Holland and France were negociated. He was one of thoſe who ſigned the proviſional articles of peace in Nov. 1782, and the definitive treaty on the 30th September 1783. He was one of the commiſſioners appointed to examine Meſmer's Animal Magnetiſm in 1784. In 1785 he arrived in Philadelphia, where he was choſen member of the ſupreme executive council, and ſhortly afterward was elected Preſident of it.

In 1787 he was appointed delegate for Pennſylvania in the grand convention and ſigned the conſtitution of the United States. He was a member of ſeveral political and benevolent ſocieties. His infirmities increaſing prevented his regular attendance in the council chamber, and in 1788 he retired from public life. He was attacked with a calculous complaint in 1781 which continued to his death, which took place on the 17th of April 1790, at the age of Eighty-four years and three months.

The following epitaph on him, was written by himſelf many years previous to his death;

THE BODY
of
Benjamin Franklin, Printer,
(Like the cover of an old book,
Its contents torn out
And ſtript of its lettering and gilding)
Lies here food for worms;
Yet the work itſelf ſhall not be loſt,
For it will (as he believed) appear once more,
In a new
And more beautiful edition,
Corrected and amended
by
The Author.

Franklin, Fort, is in Alleghany co. Pennſylvania, near the poſt called Venango, and was erected in 1787 in order to defend the frontiers of Pennſylvania from the depredations of the neighbouring Indians. It is ſeated on the S. W. bank of Alleghany river, oppoſite the mouth of French creek. N. lat. 41. 1. 40. W. long. 79. 41.; 53 miles S. S. E. of Preſque Iſle, and 63 northward of Pittſburg.—*Morſe.*

Franklin *Co.* the north-weſternmoſt in Vermont, bounded N. by Lower Canada, and W. by lake Champlain. It was lately taken from Chittenden co. and contains 20 townſhips.—*ib.*

Franklin *Co.* in Pennſylvania, bounded N. by Mifflin, N. E. by Cumberland, E. by York, S. by Waſhington co. in Maryland, W. by Bedford co. and N. W. by Hunterdon. It is computed to contain 800 ſquare miles, equal to 512,000 acres. It lies chiefly between the N. and S. Mountains, and comprehends the middle part of the beautiful and rich valley of Conegocheague; which is watered by the creek of its name, which falls into Potowmack at Williams Port in Maryland. This county exhibits a moſt luxuriant landſcape in ſummer, from the top of South Mountain. Iron ore is found here ſufficient already to furniſh work for a furnace and forge. The county is divided into 11 townſhips, which contain 15,655 inhabitants, of whom 330 are ſlaves.—*ib.*

Franklin *Co.* in Kentucky, is bounded N. by Scott co. N. W. and W. by Shelby, S. E. by Fayette, and S. by Woodford. Chief town, Frankfort.—*ib.*

FRANKLIN *Co.* in Halifax diſtrict, N. Carolina, contains 7559 inhabitants, of whom 2717 are ſlaves. It is bounded N. by Greenville, S. by Johnſton, N. E. by Warren, S. W. by Wake, and W. by Orange co. Chief town, Lewiſburg.—*ib.*

FRANKLIN *Co.* in Virginia, is bounded N. by Bedford, N. W. by Botetourt, W. by Montgomery, S. W. by Henry, S. by Patrick, and E. by Campbell co. It is about 40 miles long, and 25 broad, and contains 6842 inhabitants, including 1073 ſlaves. A range of the Alleghany Mountains paſſes through it on the N. W. It is conſequently hilly in general.—*ib.*

FRANKLIN *Co.* in Georgia, is ſituated in the Upper Diſtrict, bounded E. and N. E. by Tugulo river, which ſeparates it from the ſtate of S. Carolina; W. and N. W. by the country of the Cherokees; S. by the head branches of Broad river, and S. E. by Elbert co. It contains 1041 inhabitants, of whom 156 are ſlaves. The court-houſe is 17 miles from Hatton's Ford on Tugulo river, 25 from Elberton, and 77 from Waſhington.—*ib.*

FRANKLIN, a townſhip in Norfolk co. Maſſachuſetts; taken from Wrentham, and incorporated in 1778, and contains 17,000 acres of land. It has 1101 inhabitants; is bounded N. by Charles river, which ſeparates it from Medway, and lies 30 miles S. of Boſton.—*ib.*

FRANKLIN, a ſmall iſle at the mouth of St George's river in Lincoln co. Maine; 4 leagues ſouthward of Thomaſton.—*ib.*

FRANKLIN, a new townſhip in Dutcheſs co. New-York. By the ſtate cenſus of 1796, it appears there are 210 of its inhabitants qualified to be electors.—Alſo, a new townſhip in Delaware county, of whoſe inhabitants 239 are electors. It lies S. W. from, and borders on Harpersfield, and its W. line runs along the S. eaſtern bank of Suſquehanna river. This town was divided by an act of the Legiſlature, 1797.—*ib.*

FRANKLIN, a townſhip in Weſtmoreland co. Pennſylvania.—Alſo, 3 others in the ſame ſtate, viz. in York co. Fayette co. and in Waſhington co.—*ib.*

FRANKLIN, a townſhip, the northernmoſt in New-London co. Connecticut, 6 miles N. W. of Norwich. It contains above 1000 inhabitants, who are chiefly wealthy farmers.—*ib.*

FRANKSTOWN, a townſhip in Huntingdon co. Pennſylvania, ſituated on the Frankſtown branch of Juniatta river, 20 miles W. of Huntingdon.—*ib.*

FRAYLES, an iſland near the coaſt of New-Andaluſia, Terra Firma.—*ib.*

FREDERICA, a village in Kent co. ſtate of Delaware, ſituated between the two main branches of Mother Kill, a ſtream which falls into Delaware 7 miles from the town, and 3 S. E. of Jame's creek, which leads up to Dover. It contains about 40 houſes, and lies 12 miles E. of Dover, and 88 from Philadelphia. —*ib.*

FREDERICA, a town of Glynn co. in Georgia, is ſituated on St Simon's iſland, in a very pleaſant ſituation, and was built by General Oglethorpe. The fortreſs was beautiful and regular, but is now in ruins. The town contains but few houſes, which ſtand on an eminence, upon a branch of Alatamaha river, which waſhes the W. ſide of this agreeable iſland, and forms a bay before the town, affording a ſafe and commodious harbor for veſſels of the largeſt burden, which may lie along the wharf. It was ſettled by ſome Scotch highlanders, about the year 1735, who accepted of an eſtabliſhment both here and at Darien, to defend the colony, if needful, againſt the neighbouring Spaniards. N. lat. 31. 15. W. long. 80.—*ib.*

FREDERICK *Co.* in Maryland, is bounded N. by Pennſylvania, W. and N. W. by Waſhington, E. by Baltimore, and S. W. by Potowmack river. On the Monocacy river and its branches are about 37 griſt-mills, a furnace, iron forge, and a glaſs manufactory, called the Etna glaſs works, which are in a thriving ſtate. This county is about 30 miles each way, reckoning from the extreme parts. The Cotoctiny Mountain extends from the Potowmack in a N. direction through this county into Pennſylvania, between the South Mountain and Monocacy Creek; the eaſtern parts are generally level. It contains 30,791 inhabitants, including 3,641 ſlaves. Chief town, Frederick-town.—*ib.*

FREDERICK *Co.* in Virginia, is bounded N. by Berkley, S. by Shanandoah, W. by Hampſhire, and E. by Shanandoah river, which ſeparates it from Loudon co. It is 30 miles in length, and 20 in breadth, and contains 19,681 inhabitants, of whom 4,250 are ſlaves. Iron ore is found here in great plenty; and works have been erected which produce 160 tons of bar iron, and 650 tons of pig, annually. In one year 300 tons of bar iron were manufactured. Pots and other utenſils, caſt thinner than uſual of this iron, may be ſafely thrown into or out of the waggon, in which they are tranſported. Both this and Berkley co. has a good ſoil. Between the waters of Opeckan creek and the Shanandoah is the richeſt limeſtone land in the eaſtern parts of the ſtate.

Near the North Mountain in this county is a curious cave, by ſome called *Zaney's Cave.* Its entrance is on the top of an extenſive ridge. You deſcend 30 or 40 feet as into a well, from whence the cave then extends, nearly horizontally, 400 feet into the earth, preſerving a breadth of from 20 to 50 feet, and a height of from 5 to 12 feet. After entering this cave a few feet, the mercury, which, in the open air, was at 50. roſe to 57. of Fahrenheit's thermometer. After this may be added the Natural Well on the lands of Mr. Lewis. It is ſomewhat larger than a common well, and riſes as near the ſurface of the earth as in the neighbouring artificial wells; and is of a depth, as yet unknown. It is uſed with a bucket and windlaſs as an ordinary well. It is ſaid there is a current in it tending ſenſibly downwards. Chief town, Wincheſter.—*ib.*

FREDERICK *Houſe*, a trading ſtation in Upper Canada, on the head water of Abbitibbe river. N. lat. 48. 35. W. long. 82. 6.—*ib.*

FREDERICK, a fort in Waſhington co. Maryland, ſituated on the N. E. bank of Potowmack river, near the S. line of Pennſylvania.—*ib.*

FREDERICK, a towſhip in Montgomery co. Pennſylvania.—*ib.*

FREDERICK, a town on the N. ſide of Saſſafras river, in Cecil co. Maryland, and ſeparated by that river from George Town in Kent co. It lies 6 miles S. W. of Warwick, and 14 E. of Grove point in Cheſapeak bay. N. lat. 39. 22. 30.—*ib.*

Fredericksburg, a poſt town in Spotſylvania co. Virginia; ſituated on the S. W. bank of Rappahannock river, 110 miles from its mouth in Cheſapeak bay. It is an incorporated town, and regularly laid out into ſeveral ſtreets, the chief of which runs parallel with the river, and in all contains upwards of 200 houſes, two tobacco warehouſes, and ſeveral ſtores of well aſſorted goods. Its public buildings are an Epiſcopal church, an academy, court-houſe and gaol. It is a place of conſiderable trade and contains about 2000 inhabitants, of whom 587 are ſlaves. A forge in this neighborhood made, ſometime ago, about 300 tons of bar iron in a year, from pigs imported from Maryland. It is 50 miles S. S. W. of Alexandria, 68 N. by E. of Richmond, 102 S. W. of Baltimore, and 205 S. W. of Philadelphia. N. lat. 38. 22. W. long 77. 36.—*ib.*

FREDERICKSTOWN, a townſhip in Dutcheſs co. New-York, which contains 5932 inhabitants, of whom 188 are qualified to be electors, and 63 are ſlaves.—*ib.*

FREDERICKTON, a conſiderable townſhip in the province of New-Brunſwick, 90 miles up St John's river, which is thus far navigable for ſloops.—*ib.*

FREDERICKTOWN, a poſt town of Maryland, and capital of Frederick co. ſituated on both ſides of Carrolls' creek, a ſmall ſtream that empties into Monocacy river over which are two bridges. The ſtreets are regularly laid out, interſecting each other at right angles. The dwelling-houſes, chiefly of ſtone and brick, are about 700 in number, many of which are handſome and commodious. The public edifices are, one church for Preſbyterians, two for German Lutherans and Calviniſts, and one for Baptiſts, an elegant court-houſe, a gaol, and a brick market-houſe. It is a very flouriſhing town, and has conſiderable trade with the back country. The Etna glaſs works are ſituated 4 miles above the town, on Tuſkarora creek. Fredericktown is 4 miles E. of Cotoctin mountain, 47 W. by N. of Baltimore, 24 E. of Sharpſburg, and 148 S. W. by W. of Philadelphia, N. lat. 39. 24.—*ib.*

FREEHOLD, a town in Monmouth co. New-Jerſey, 15 miles W. of Shrewſbury, and 20 S. E. by S. of New-Brunſwick. In this town was fought the obſtinate battle called the Monmouth battle, on the 28th of June, 1778. There is an academy in this town. Freehold contains 3785 inhabitants, of whom 627 are ſlaves.—*ib.*

Freehold, a townſhip in Albany co. New-York, containing 1822 inhabitants, of whom 562 are qualified electors, and 5 are ſlaves.—*ib.*

FREEPORT, a townſhip in Cumberlard co. diſtrict of Maine, ſituated at the head of Caſco bay; adjoining to Durham on the N. E. and to North Yarmouth on the S. W.; about 10 miles N. E. of Portland, and 140 N. by E. of Boſton. It was incorporated in 1789, and contains 1330 inhabitants.—*ib.*

FREESTONE-GAP, a place ſo called, in Tenneſſee, 25 miles from Hawkin's court-houſe, and 35 from Cumberland mountain.—*ib.*

FREETOWN, a thriving townſhip in Briſtol co. Maſſachuſetts, incorporated in 1683, contains 2202 inhabitants, and lies 50 miles ſoutherly of Boſton.—*ib.*

FRE'GATES Françaiſe *Baſſe de*, the name given by La Perouſe to a dangerous reef of ſunken rocks which he diſcovered in the Pacific ocean. On the north-weſt extremity of this reef they perceived an iſlet or ſplit rock from 20 to 25 fathoms in height and about 50 toiſes in diameter. From this iſlet the reef extends more than four leagues to the ſouth-eaſt; and upon the extremity of the point in that direction, the frigates had almoſt ſtruck before the breakers were obſerved. This was during a fine clear night and ſmooth ſea. With great propriety, the Commodore returned in the morning to aſcertain the geographical ſituation of this unknown rock; and he eſtimated the iſlet to be in 23° 45′ N. Lat. and 168° 10′ W. Long. from Paris.

FRENCH, a ſmall river in Maſſachuſetts, has its ſource in a ſmall pond, on the borders of Leiceſter and Spencer, in Worceſter co. and runs through Oxford and joins Quinebauge river, in Thompſon townſhip, in Connecticut. It derives its name from the French Proteſtants, who obtained a ſettlement in the town of Oxford, after the revocation of the edict of Nantz, in 1685.—*Morſe.*

French Broad, a navigable river in Tenneſſee, which riſes on the S. E. ſide of the Great Iron and Bald mountains, in N. Carolina. It is formed by two main branches, which receive ſeveral ſtreams in their courſe. Theſe unite about 58 miles from the ſource of the Nolachucky, the eaſtern branch; thence it flows N. weſterly about 25 miles, and joins the Holſton 11 miles above Knoxville, and is 400 or 500 yards wide. The navigation of this branch is much interrupted by rocks, as is alſo the Tenneſſee branch, which joins the main river 50 miles below this.

A large, clear, medicinal ſpring, ſaid to be efficacious in curing many diſeaſes, has been lately diſcovered on the waters of this river, about 30 miles in a direct line from its mouth. The water is ſo hot, that a patient at firſt going into it can ſcarcely ſupport it. Nearer the mouth of the river, a valuable lead mine has been diſcovered.—*ib.*

French *Creek*, a N. weſtern water of Alleghany river, into which it falls along the N. ſide of Fort Franklin, 80 miles N. by E. of Pittſburg. It affords the neareſt paſſage to lake Erie. It is navigable with ſmall boats to Le Beuf, by a very crooked channel; the portage thence to Preſque Iſle, from an adjoining peninſula, is 15 miles. This is the uſual route from Quebec to Ohio.—*ib.*

French *Lick*, in Tenneſſee, is the name of a ſalt ſpring, near which the town of Naſhville now ſtands.—*ib.*

French *Town*, in Cecil co. Maryland, lies on the E. ſide of Elk river, a mile S. of Elkton, from which it is ſeparated by Elk creek. Elk ferry is 6 miles below this.—*ib.*

FRENCHMAN'*s Bay*, lies on the ſea coaſt of Lincoln co. Maine, and is formed by Mount Deſert iſland on the weſtward, and the peninſula of Goldſborough townſhip on the eaſtward.—Round Mount Deſert iſland it has an inland circular communication with Blue Hill bay.—*ib.*

FRENEUSE *Lake*, a large collection of water, through which St John's river in New-Brunſwick, paſſes. In ſome maps this appears only as a dilatation of the river; but in others it appears as a large lake of very irregular figure, and receiving conſiderable ſtreams from the circumjacent country.—*ib.*

FRICTION, in mechanics, is a ſubject of great importance both to the practical engineer and to the ſpeculative philoſopher. It is therefore our duty to correct, in this Supplement, the miſtakes into which we fell when treating of that ſubject in the *Encyclopædia*. What we have there taught of friction (ſee MECHANICS Sect. II. § 8.) is taken from Ferguſon; but it has been ſhewn by Mr Vince, that the experiments from which his concluſions were drawn were not properly inſtituted. That eminent mathematician and philoſopher therefore entered upon the inveſtigation of the ſubject anew, and endeavoured, by a ſet of experiments, to determine the following queſtions:

1. Whether friction be a uniformly retarding force?
2. The quantity of friction?
3. Whether the friction varies in proportion to the preſſure or weight?
4. Whether the friction be the ſame on whichever of its ſurfaces a body moves?

1. With reſpect to the firſt of theſe queſtions, the author truly obſerves, that if friction be a uniform force, the difference between it and the given force of the moving power employed to overcome it muſt alſo be uniform; and that therefore the moving power, if it be a body deſcending by its own weight, muſt deſcend with a uniformly accelerated velocity, juſt as when there was no friction. The ſpaces deſcribed from the beginning of the motion will indeed be diminiſhed in any given time on account of the friction; but ſtill they muſt be to each other as the ſquares of the times employed. See DYNAMICS in this *Supplement.*

2. A plane was therefore adjuſted parallel to the horizon, at the extremity of which was placed a pulley, which could be elevated or depreſſed in order to render the ſtring which connected the body and the moving force parallel to the plane. A ſcale accurately divided was placed by the ſide of the pulley perpendicular to the horizon, by the ſide of which the moving force deſcended; upon the ſcale was placed a moveable ſtage, which could be adjuſted to the ſpace through which the moving force deſcended in any given time; which time was meaſured by a well-regulated pendulum clock vibrating ſeconds. Every thing being thus prepared, the following experiments were made to aſcertain the law of friction.

3. *Exp.* 1. A body was placed upon the horizontal plane, and a moving force applied, which, from repeated trials, was found to deſcend $52\frac{1}{2}$ inches in 4″; for by the beat of the clock, and the ſound of the moving force when it arrived at the ſtage, the ſpace could be very accurately adjuſted to the time: The ſtage was then removed to that point to which the moving force would deſcend in 3″, upon ſuppoſition, that the ſpaces deſcribed by the moving power were as the ſquares of the times; and the ſpace was found to agree very accurately with the time; the ſtage was then removed to that point to which the moving force ought to deſcend 2″ upon the ſame ſuppoſition, and the deſcent was found to agree exactly with the time: laſtly, the ſtage was adjuſted to that point to which the moving force ought to deſcend in 1″, upon the ſame ſuppoſition, and the ſpace was obſerved to agree with the time. Now, in order to find whether a difference in the time of deſcent could be obſerved by removing the ſtage a little above and below the poſitions which correſponded to the above times the experiment was tried, and the deſcent was always found too ſoon in the former, and too late in the latter caſe; by which the author was aſſured that the ſpaces firſt mentioned correſponded exactly to the times. And, for the greater certainty, each deſcent was repeated eight or ten times; and every caution uſed in this experiment was alſo made uſe of in all the following.

Exp. 2. A ſecond body was laid upon the horizontal plane, and a moving force applied which deſcended $41\frac{3}{4}$ inches in 3″; the ſtage was then adjuſted to the ſpace correſponding to 2″, upon ſuppoſition that the ſpaces deſcended through were as the ſquares of the times, and it was found to agree accurately with the time; the ſtage was then adjuſted to the ſpace correſponding to 1″, upon the ſame ſuppoſition, and it was found to agree with the time.

Exp. 3. A third body was laid upon the horizontal plane, and a moving force applied, which deſcended $59\frac{5}{8}$ inches in 4″; the ſtage was then adjuſted to the ſpace correſponding to 3″, upon ſuppoſition that the ſpaces deſcended through were as the ſquares of the times, and it was found to agree with the time; the ſtage was then adjuſted to the ſpace correſponding to 2″, upon the ſame ſuppoſition, and it was found to agree with the time; the ſtage was then adjuſted to the ſpace correſponding to 1″, and was found to agree with the time.

Exp. 4. A fourth body was then taken and laid upon the horizontal plane, and a moving force applied, which deſcended 55 inches in 4″; the ſtage was then adjuſted to the ſpace through which it ought to deſcend in 3″, upon ſuppoſition that the ſpaces deſcended through were as the ſquares of the times, and it was found to agree with the time; the ſtage was then adjuſted to the ſpace correſponding to 2″, upon the ſame ſuppoſition, and was found to agree with the time; laſtly, the ſtage was adjuſted to the ſpace correſponding to 1″, and it was found to agree exactly with the time.

Beſides theſe experiments, a great number of others were made with hard bodies, or thoſe whoſe parts ſo firmly cohered as not to be moved *inter ſe* by the friction; and, in each experiment, bodies of very different degrees of friction were choſen, and the reſults all agreed with thoſe related above; we may therefore conclude, that the *friction of hard bodies in motion is a uniformly retarding force.*

But to determine whether the ſame was true for bodies when covered with cloth, woollen, &c. experiments were made in order to aſcertain it; when it was found, in all caſes, that the retarding force increaſed with the velocity; but, upon covering bodies with paper, the conſequences were found to agree with thoſe related above.

4. Having proved that the retarding force of all hard bodies ariſing from friction is uniform, the quantity of friction, conſidered as equivalent to a weight without inertia drawing the body on the horizontal plane backwards, or acting contrary to the moving force, may be immediately deduced from the foregoing experiments. For let $M =$ the moving force expreſſed by its weight; $F =$ the friction; $W =$ the weight of the body upon the horizontal plane; $S =$ the ſpace through which the moving force deſcended in the time t expreſſed in ſeconds; $r = 16\frac{1}{12}$ feet; then the whole accelerative

force (the force of gravity being unity) will be $\frac{M - F}{M + W}$; hence, by the laws of uniformly accelerated motions, $\frac{M - F}{M + W} \times rt^2 = S$, conſequently $F = M - \frac{\overline{M \times W} \times S}{rt^2}$ To exemplify this, let us take the caſe of the laſt experiment, where $M = 7$, $W = 25\frac{3}{4}$, $S = 4\frac{7}{12}$ feet, $t = 4''$; hence $F = 7 - \frac{32\frac{3}{4} \times 4\frac{7}{12}}{16\frac{1}{12} \times 16} = 6.417$; conſequently the friction was to the weight of the rubbing body as 6.4167 to 25.75. And the great accuracy of determining the friction by this method is manifeſt from hence, that if an error of 1 inch had been made in the deſcent (and experiments carefully made may always determine the ſpace to a much greater exactneſs), it would not have affected the concluſion $\frac{1}{100}$dth part of the whole.

5. We come in the next place to determine, whether friction, *cæteris paribus*, varies in proportion to the weight or preſſure. Now if the whole quantity of the friction of a body, meaſured by a weight without inertia equivalent to the friction drawing the body backwards, increaſes in proportion to its weight, it is manifeſt, that the retardation of the velocity of the body ariſing from the friction will not be altered; for the retardation varies as $\frac{\text{Quantity of friction}}{\text{Quantity of matter}}$; hence, if a body be put in motion upon the horizontal plane by any moving force, if both the weight of the body and the moving force be increaſed in the ſame ratio, the acceleration ariſing from that moving force will remain the ſame, becauſe the accelerative force varies as the moving force divided by the whole quantity of matter, and both are increaſed in the ſame ratio; and if the quantity of friction increaſes alſo as the weight, then the retardation ariſing from the friction will, from what has been ſaid, remain the ſame, and therefore the whole acceleration of the body will not be altered; conſequently the body ought, upon this ſuppoſition, ſtill to deſcribe the ſame ſpace in the ſame time. Hence, by obſerving the ſpaces deſcribed in the ſame time, when both the body and the moving force are increaſed in the ſame ratio, we may determine whether the friction increaſes in proportion to the weight. The following experiments were therefore made in order to aſcertain this matter:

Exp. 1. A body weighing 10 oz. by a moving force of 4 oz. deſcribed in 2′ a ſpace of 51 inches; by loading the body with 10 oz. and the moving force with 4 oz. it deſcribed 56 inches in 2″; and by loading the body again with 10 oz. and the moving force with 4 oz. it deſcribed 63 inches in 2″.

Exp. 2. A body, whoſe weight was 16 oz. by a moving force of 5 oz. deſcribed a ſpace of 49 inches in 3″; and by loading the body with 64 oz. and the moving force with 20 oz. the ſpace deſcribed in the ſame time was 64 inches.

Exp, 3. A body weighing 6 oz. by a moving force of 2½ oz. deſcribed 28 inches in 2″; and by loading the body with 24 oz. and the moving force with 10 oz. the ſpace deſcribed in the ſame time was 54 inches.

Exp. 4. A body weighing 8 oz. by a moving force of 4 oz. deſcribed 33½ inches in 2″; and by loading the body with 8 oz. and the moving force with 4 oz. the ſpace deſcribed in the ſame time was 47 inches.

Exp. 5. A body whoſe weight was 9 oz. by a moving force of 4½ oz. deſcribed 48 inches in 2′; and by loading the body with 9 oz. and the moving force with 4½ oz. the ſpace deſcribed in the ſame time was 60 inches.

Exp. 6. A body weighing 10 oz. by a moving force of 3 oz. deſcribed 20 inches in 2″; by loading the body with 10 oz. and the moving force with 3 oz. the ſpace deſcribed in the ſame time was 31 inches; and by loading the body again with 30 oz. and the moving force with 9 oz. the ſpace deſcribed was 34 inches in 2″.

From theſe experiments, and many others which it is not neceſſary here to relate, it appears, that the ſpace deſcribed is always increaſed by increaſing the weight of the body and the accelerative force in the ſame ratio; and as the acceleration ariſing from the moving force continued the ſame, it is manifeſt, that the retardation ariſing from the friction muſt have been diminiſhed, for the whole accelerative force muſt have been increaſed on account of the increaſe of the ſpace deſcribed in the ſame time; and hence (as the retardation from friction varies as $\frac{\text{Quantity of friction}}{\text{Quantity of matter}}$) *the quantity of friction increaſes in a leſs ratio than the quantity of matter or weight of the body.*

6. We come now to the laſt thing which it was propoſed to determine, that is, whether the friction varies by varying the ſurface on which the body moves. Let us call two of the ſurfaces A and *a*, the former being the greater, and the latter the leſs. Now the weight on every given part of *a* is as much greater than the weight on an equal part of A, as A is greater than *a*; if therefore the friction was in proportion to the weight, *cæteris paribus*, it is manifeſt, that the friction on *a* would be equal to the friction on A, the whole friction being, upon ſuch a ſuppoſition, as the weight on any given part of each ſurface multiplied into the number of ſuch parts or into the whole area, which products, from the proportion above, are equal. But from the laſt experiments it has been proved, that the friction on any given ſurface increaſes in a leſs ratio than the weight; conſequently the friction on any given part of *a* has a leſs ratio to the friction on an equal part of A than A has to *a*, and hence the friction on *a* is leſs than the friction on A, that is, the ſmalleſt ſurface has always the leaſt friction.

As this concluſion is contrary to the generally received opinion, Mr Vince thought it proper to confirm it by a ſet of experiments made with different bodies of exactly the ſame degree of roughneſs on their two ſurfaces.

Exp. 1. A body was taken whoſe flat ſurface was to its edge as 22 : 9, and with the ſame moving force the body deſcribed on its flat ſide 33½ inches in 2″, and on its edge 47 inches in the ſame time.

Exp. 2. A ſecond body was taken whoſe flat ſurface was to its edge as 32 : 3, and with the ſame moving force it deſcribed on its flat ſide 32 inches in 2″, and on its edge it deſcribed 37½ inches in the ſame time.

Exp. 3. He took another body and covered one of its ſurfaces, whoſe length was 9 inches, with a fine rough paper, and by applying a moving force, it deſcribed 25 inches in 2″; he then took off ſome paper from the middle, leaving only $\frac{3}{8}$ of an inch at the two ends, and with the ſame moving force it deſcribed 40 inches in the ſame time.

Exp. 4. Another body was taken which had one of its ſurfaces, whoſe length was 9 inches, covered with a fine rough paper, and by applying a moving force it deſcribed 42 inches in 2″; ſome of the paper was then taken off from the middle, leaving only $1\frac{3}{8}$ inches at the two ends, and with the ſame moving force it deſcribed 54 inches in 2″; he then took off more paper, leaving only $\frac{1}{4}$ of an inch at the two ends, and the body then deſcribed, by the ſame moving force, 60 inches in the ſame time.

In the two laſt experiments the paper which was taken off the ſurface was laid on the body, that its weight might not be altered.

Exp. 5. A body was taken whoſe flat ſurface was to its edge as 30 : 17; the *flat* ſide was laid upon the horizontal plane, a moving force was applied, and the ſtage was fixed in order to ſtop the moving force, in conſequence of which the body would then go on with the velocity acquired until the friction had deſtroyed all its motion; when it appeared from a mean of 12 trials that the body moved, after its acceleration ceaſed, $5\frac{2}{5}$ inches before it ſtopped. The *edge* was then applied, and the moving force deſcended through the ſame ſpace; and it was found, from a mean of the ſame number of trials, that the ſpace deſcribed was $7\frac{1}{3}$ inches before the body loſt all its motion, after it ceaſed to be accelerated.

Exp. 6. Another body was then taken whoſe flat ſurface was to its edge as 60 : 19, and, by proceeding as before, on the flat ſurface it deſcribed, at a mean of 12 trials $5\frac{1}{8}$ inches, and on the edge $6\frac{11}{24}$ inches, before it ſtopped, after the acceleration ceaſed.

Exp. 7. Another body was taken whoſe flat ſurface was to its edge as 26 : 3; and the ſpaces deſcribed on theſe two ſurfaces, after the acceleration ended, were, at a mean of ten trials, $4\frac{3}{7}$ and $7\frac{7}{10}$ inches reſpectively.

From all theſe different experiments it appears, that the ſmalleſt ſurface had always the leaſt friction, which agrees with the conſequence deduced from the conſideration that the friction does not increaſe in ſo great a ratio as the weight; we may therefore conclude, that *the friction of a body does not continue the ſame when it has different ſurfaces applied to the plane on which it moves, but that the ſmalleſt ſurface will have the leaſt friction.*

To the experiments inſtituted by Mr Ferguſon and others, from which concluſions have been drawn ſo different from theſe, our author makes the following objections: It was their object to find what moving force would *juſt* put a body at reſt in motion; and having, as they thought, found it, they thence concluded, that the accelerative force was then equal to the friction. But it is manifeſt, as Mr Vince obſerves, that any force which will put a body in motion muſt be *greater* than the force which oppoſes its motion, otherwiſe it could not overcome it; and hence, if there were no other objection than this, it is evident, that the friction could not be very accurately obtained: but there is another objection which totally deſtroys the experiment ſo far as it tends to ſhew the quantity of friction, which is the ſtrong coheſion of the body to the plane when it lies at reſt; and this is confirmed by the following experiments. *1ſt*, A body of $12\frac{3}{4}$ oz. was laid upon an horizontal plane, and then loaded with a weight of 8lb. and ſuch a moving force was applied as would, when the body was juſt *put* in motion, continue that motion without any acceleration; in which caſe the friction muſt be juſt equal to the accelerative force. The body was then ſtopped, when it appeared, that the ſame moving force which had *kept* the body in motion before, would not *put* it in motion, and it was found neceſſary to take off $4\frac{1}{2}$ oz. from the body before the ſame moving force *would* put it in motion; it appears therefore, that this body, when laid upon the plane, at reſt, acquired a very ſtrong coheſion to it. *2dly*, A body whoſe weight was 16 oz. was laid at reſt upon the horizontal plane, and it was found that a moving force of 6 oz. would juſt *put* it in motion; but that a moving force of 4 oz. *would*, when it was juſt put in motion, continue that motion without any acceleration, and therefore the accelerative force muſt *then* have been equal to the friction, and not when the moving force of 6 oz. was applied.

From theſe experiments therefore it appears, how very conſiderable the coheſion was in proportion to the friction when the body was in motion; it being, in the latter caſe, almoſt $\frac{1}{3}$d, and in the former it was found to be very nearly equal to the whole friction. All the concluſions therefore deduced from the experiments, which have been inſtituted to determine the friction from the force neceſſary to *put* a body in motion, have manifeſtly been totally falſe; as ſuch experiments only ſhew the reſiſtance which ariſes from the coheſion and friction conjointly.

Our author concludes this part of his ſubject with the following remark upon n° 5: "It appears from all the experiments (ſays he) which I have made, that the proportion of the increaſe of the friction to the increaſe of the weight was different in all the different bodies which were made uſe of; no general rule therefore can be eſtabliſhed to determine this for *all* bodies, and the experiments which I have hitherto made have not been ſufficient to determine it for the *ſame* body."

He then proceeds to eſtabliſh a theory upon the principles which he has deduced from his experiments. That theory is comprehended in five propoſitions, of which the object of the firſt is "to find the time of deſcent, and the number of revolutions made by a cylinder rolling down an inclined plane in conſequence of its friction.

II. "To determine the ſpace through which a body, projected on an horizontal plane with a given velocity, will move before it ſtops, or before its motion becomes uniform.

III. "To find the centre of friction.

IV. "To determine, from the given velocity with which a body begins to revolve about the centre of its baſe, the number of revolutions which that body will make before all its motion be deſtroyed.

V. "To find the nature of the curve deſcribed by any point of a body affected by friction when it deſcends down any inclined plane."

To give the ſolutions of theſe problems, with the corollaries deduced from them, would ſwell this article to very little purpoſe; for they would be unintelligible to the mere mechanic, and the mathematician will either ſolve them for himſelf, or have recourſe to the original memoir, where he will find ſolutions at once elegant and perſpicuous.

FRIEDBURG, a Moravian ſettlement in Wachovia, or Surry co. N. Carolina.—*Morse.*

FRIEDENSHUETTEN, a Moravian ſettlement, whoſe name ſignifies *Tents of Peace*, ſituated on Suſquehanna river, in Pennſylvania, about 24 miles below Tioga point; eſtabliſhed by the United Brethren in 1765. It then conſiſted of 13 Indian huts, and upwards of 40 houſes, built after the European manner, with a neat chapel. Next to the houſes the ground was laid out in gardens; and between the ſettlement and the river about 250 acres were divided into regular plantations of Indian corn.—*ib.*

FRIEDENSTADT, or *Town of Peace*, a Moravian ſettlement which was eſtabliſhed between Great Beaver and Yellow creeks; about 40 miles N. W. of Pittſburg. It was abandoned in 1773.—*ib.*

FRIGORIFIC MIXTURES, are thoſe which experience has taught philoſophers to employ for the purpoſe of producing artificial cold. Some of theſe mixtures are enumerated under the title COLD (*Encycl*), and a much more accurate liſt of them is given, together with the principle upon which they produce their effect, in the article CHEMISTRY, n° 282. (*Suppl.*) There is one mixture, however, not mentioned in that liſt, which was employed by Seguin, and ſeems, on many accounts, to be the moſt eligible that has yet been propoſed. Conſidering the muriats (ſee CHEMISTRY-*Index-Suppl.*) as a claſs of ſalts beſt ſuited for the purpoſe, he gave the decided preference to muriat of lime in chryſtals; and his method was to mix the cryſtals, previouſly pulveriſed, with an equal weight of uncompreſſed ſnow.

By means of this mixture Mr W. H. Pepys junior, of the London Philoſophical Society, with the aſſiſtance of ſome friends, froze, on the 8th of February 1799, 56 lbs. averdupoiſe of mercury into a ſolid maſs. The mercury was put into a ſtrong bladder and well ſecured at the mouth, the temperature of the laboratory at the time being + 33°. A mixture conſiſting of muriat of lime 2 lb. at + 33°, and the ſame weight of ſnow at + 32° gave — 42° (A). The mercury was put as gently as poſſible into this mixture (to prevent a rupture of the bladder), by means of a cloth held at the four corners. When the cold mixture had robbed the mercury of ſo much of its heat as to have its own temperature thereby raiſed from — 42° to + 5, another mixture, the ſame in every reſpect as the laſt, was made, which gave, on trial with the thermometer, — 43°. The mercury was now received into the cloth, and put gently into this new mixture, where it was left to be cooled ſtill lower than before.

In the mean time five pounds of muriat of lime, in a large pail made of tinned iron, and japanned inſide and outſide, was placed in a cooling mixture in an earthenware pan. The mixture in the pan, which conſiſted of 4lb. of muriat of lime and a like quantity of ſnow, of the ſame temperature as the former, in one hour reduced the 5 lb. of muriat in the pail to — 15°. The mixture was then emptied out of the earthen pan, and four large corks, at proper diſtances, placed on its bottom, to ſerve as reſts for the japanned pail which was now put into the pan. The corks anſwered the purpoſe of inſulating the inner veſſel, while the exterior one kept off the ſurrounding atmoſphere, and preſerved the air between the two at a low temperature.

To the 5 lb. of muriat of lime which had been cooled, as already noticed, to — 15°, and which ſtill remained in the metallic veſſel, was now added ſnow, uncompreſſed and free from moiſture, at the uſual temperature of + 32°. In leſs than three minutes the mixture gave a temperature of — 62° : a degree of cold which perhaps was never before produced in this country, being 94° below the freezing point of water.

The mercury, which by immerſion in the ſecond cooling mixture to which it was expoſed, was, by this time reduced to — 30°, was now, by the means employed before, cautiouſly put into the laſt made mixture of the temperature of — 62°. A hoop, with net-work faſtened to its upper edge, and of ſuch a breadth in the rim that the net work, when loaded with the bladder of mercury could not reach its lower edge, was at the bottom of the mixture, to prevent the bladder from coming in contact with the veſſel; by which means the mercury was ſuſpended in the middle of the mixture. As ſoon as the bladder was ſafely depoſited on the net-work, the veſſels were carefully covered over with a cloth, to impede the paſſage of heat from the ſurrounding atmoſphere into the freezing materials. The condenſation of moiſture from the atmoſphere by the agency of ſo low a temperature was greater than could have been expected: It floated like ſteam over the veſſels, and, but for the interpoſed covering, would have given the mixture more temperature than was deſirable.

After one hour and forty minutes they found, by means of a ſearcher introduced for the purpoſe, that the mercury was ſolid and fixed. The temperature of the mixture at this time was — 46, that is 16° higher than when the mercury was put into it.

Our young philoſophers having neglected to ſling the hoop and net-work in ſuch a manner as might have enabled them to lift it out of the mixture at once, with the bladder and its contents, were obliged to turn out the whole contents of the pail into a large evaporating capſule made of iron. This was not effected without the mercury ſtriking againſt its bottom and being fractured, though it received a conſiderable increaſe of temperature from the capſule. The fracture was ſimilar to that of zinc, but with parts more cubical. The larger pieces were kept for ſome minutes before fuſion took place, while others were twiſted and bent into various forms, to the no ſmall gratification and ſurpriſe of thoſe who had never witneſſed or expected to ſee ſuch an effect produced on ſo fuſible a metal.

In experiments of the kind here deſcribed, all the exterior veſſels ſhould be of earthen-ware or wood, which being bad conductors of heat, prevent the ingredients from receiving heat from the atmoſphere and ſurrounding objects with the ſame facility that they would through metals; and, for a ſimilar reaſon, the interior veſſels are beſt of metal, that they may allow the

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(A) The thermometer made uſe of in this experiment was filled with tinged alcohol, and accurately divided according to Fahrenheit's ſcale.

the heat to paſs more readily from the ſubſtance to be cooled into the frigorific mixture employed for that purpoſe.

Muriat of lime is certainly the moſt powerful, and at the ſame time the moſt economical ſubſtance that can be employed for producing artificial cold; for its firſt coſt is a mere trifle, being a reſiduum from many chemical proceſſes, as the diſtillation of pure ammonia, &c. and often thrown away: beſides, it may be repeatedly uſed for ſimilar experiments, nothing being neceſſary for this purpoſe but filtration and evaporation to bring it to its firſt ſtate. The evaporation ſhould be carried on till the ſolution becomes as thick as a ſtrong ſyrup, and upon cooling the whole will be cryſtalliſed: it muſt then be powdered, put up in dry bottles, well corked, and covered with bladder or cement to prevent liquefaction; which otherwiſe would ſoon take place, owing to the great affinity the muriat has for moiſture.

The powerful effects produced by the frigorific mixture of muriat of lime and ſnow, preſent a wide field for experiments to determine the poſſibility of fixing ſome of the gaſes by intenſe cold. And we are happy to be informed by Mr Pepys, that, as ſoon as an opportunity offers, he and his friends mean to make ſome experiments with that view, and to communicate the reſult of them to the editor of the valuable miſcellany* from which we have taken this account of his experiment on mercury.

FRIO, a ſmall iſland on the coaſt of the Brazils, ſituated in 32° 2′ ſouth lat. and 41° 31′ 45″ weſt lon. The land of Frio is high, with a hollow in the middle, which gives it, at a diſtance, the reſemblance of two ſeparate iſlands. The paſſage between the iſland and the continent is about a mile broad, and ſeemed to Sir Eraſmus Gower to be clear from ſhoals.

FRONTINAC, FORT, a fortreſs in Canada, ſituated at the head of a fine bay or harbor, on the N. W. ſide of the outlet of Lake Ontario, where all ſorts of veſſels may ride in ſafety. It is a league from the mouth of the lake, and a ſhort diſtance S. of Kingſton, and about 300 miles from Quebec. The winter about this place is much ſhorter than at Quebec; and the ſoil is ſo well cultivated, as to produce all ſorts of European and Indian corn, and fruits. Here is one of the moſt charming proſpects in the world, during ſpring and ſummer. The St Lawrence and the mouth of Lake Ontario, contain a number of beautiful and fertile iſlands of different magnitudes, and well wooded, and the bay often preſents to the view veſſels at anchor, and others paſſing to and from the lake. But the misfortune is, that the advantageous communication between this lake, Montreal and Quebec, is ſomewhat difficult and dangerous, on account of the river being full of rocks and water falls. This, together with the ambuſcades of the Iroquois Indians, induced the French to abandon and deſtroy the ſtrong works they had erected here. This happened in 1689. After this they retook and repaired the place. At length the Britiſh, under col. Bradſtreet, took it in 1759, to whom it was confirmed at the peace in 1763.

A river has lately been ſurveyed by the deputy ſurveyor general of Canada, from its entrance into the lake at Kenty, near Cadaraqui, to its ſource in lake St Clie; from which there is an eaſy and ſhort portage acroſs N. W. to the N. E. angle of Lake Huron, and another that is neither long nor difficult, to the ſouthward, to the old ſettlement of Toronto. This is a ſhort route from Fort Frontenac to Michillimackinack. —*Morſe.*

FROST, as is well known in Scotland, is particularly deſtructive to the bloſſom of fruit trees; and the following method of ſecuring ſuch trees from being damaged by early froſts may be acceptable to many of our readers. A rope is to be interwoven among the branches of the tree, and one end of it brought down ſo as to be immerſed in a bucket of water. The rope, it is ſaid, will act as a conductor, and convey the effects of the froſt from the tree to the water. This idea is not new, for the following paſſage may be found in Colerus: "If you dig a trench around the root of a tree, and fill it with water, or keep the roots moiſt till it has bloomed, it will not be injured by the froſt. Or, in ſpring, ſuſpend a veſſel filled with water from the tree. If you wiſh to preſerve the bloom from being hurt by the froſt, place a veſſel of water below it, and the froſt will fall into it." *Philoſophical Magazine*, n° 11.

FROWSAC *Channel*, or the Gut of Canſo, a ſtrait between Nova-Scotia and Cape Breton Iſland, 5 French leagues long, and one broad.—*Morſe.*

FRYDUFFRIN, a townſhip in Cheſter co. Pennſylvania.—*ib.*

FRYING-PAN, a dangerous ſhoal ſo called from its form. It lies at the entrance of Cape Fear river, in North-Carolina; the S. part of it is in N. lat. 33. 32. 6 miles from Cape Fear pitch, and 24 S. E. by S. from the light-houſe on Bald Head.

FRYSBURGH, or *Fryburg*, a townſhip pleaſantly ſituated in York co. in the diſtrict of Maine, in a bow formed by the N. branch of Great Oſſipee river. It was incorporated in 1777, has a flouriſhing academy, and contains 447 inhabitants. This is the ancient Indian village Peckwalket, through which the upper part of Saco meanders; 60 miles from the ſea, and 120 N. by E. of Boſton. N. lat. 44. 2. W. long. 70. 47. 30.—*ib.*

FUCA, STRAITS OF JUAN DE, lie on the N. W. coaſt of N. America. The entrance lies between Cape Flattery on the S. ſide, in N. lat. 48. 25. W. long. 124. 52. to the oppoſite coaſt of the Quadras iſles, in N. lat. 48. 53. 30. It communicates with Pintard's ſound, and thus forms Quadras iſles; in the S. eaſtern coaſt of which lies Nootka ſound. The Spaniards, jealous of their right to the American coaſt, eſtabliſhed a ſettlement at this place.—*ib.*

FUEL, whatever is proper to burn, or make a fire, either for warming a room or dreſſing victuals. The fuel moſt generally uſed in Great Britain is pit coal, which is a very expenſive article; and that expence is greatly increaſed by the waſte of coal occaſioned by the injudicious manner in which fires in open chimneys are commonly managed. The enormous waſte of fuel in London, for inſtance, may be eſtimated by the vaſt dark cloud which continually hangs over that great metropolis, and frequently overſhadows the whole country far and wide; for this denſe cloud is certainly compoſed almoſt entirely of unconſumed coal, which has eſcaped by the chimneys, and continues to ſail about in the air, till, having loſt the heat which gave it volatility, it falls in a dry ſhower of extremely fine black duſt to the ground,

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* *The Philoſophical Magazine.*

Fuel. ground, obſcuring the atmoſphere in its deſcent, and frequently changing the brighteſt day into more than Egyptian darkneſs.

"I never (ſays Count Rumford) view from a diſtance, as I come into town, this black cloud which hangs over London, without wiſhing to be able to compute the immenſe number of chaldrons of coals of which it is compoſed; for could this be aſcertained, I am perſuaded ſo ſtriking a fact would awaken the curioſity, and excite the aſtoniſhment of all ranks of the inhabitants; and perhaps turn their minds to an object of economy to which they have hitherto paid little attention."

The object to which the benevolent author more particularly wiſhes to direct the public attention, is the lighting of a coal fire, in which more wood ſhould be employed than is commonly uſed, and fewer coals; and as ſoon as the fire burns bright, and the coals are well lighted, and not before, more coals ſhould be added to increaſe the fire to its proper ſize.

Kindling balls, compoſed of equal parts of coal,—charcoal,—and clay, the two former reduced to a fine powder, well mixed and kneaded together, with the clay moiſtened with water, and then formed into balls of the ſize of hens eggs, and thoroughly dried, might be uſed with great advantage inſtead of wood for kindling fires. Theſe kindling balls may be made ſo inflammable as to take fire in an inſtant and with the ſmalleſt ſpark, by dipping them in a ſtrong ſolution of nitre and then drying them again: and they would neither be expenſive nor liable to be ſpoiled by long keeping. Perhaps a quantity of pure charcoal, reduced to a very fine powder, and mixed with the ſolution of nitre in which they are dipped, would render them ſtill more inflammable.

The Count thinks that the fires which are made in the open chimneys of elegant apartments might be greatly improved by preparing the fuel; for nothing (ſays he) was ever more dirty, inelegant, and diſguſting than a common coal fire.

Fire balls, of the ſize of gooſe eggs, compoſed of coal and charcoal in powder, mixed up with a due proportion of wet clay, and well dried, would make a much more cleanly, and in all reſpects a pleaſanter fire than can be made with crude coals; and, he believes, would not be more expenſive fuel. In Flanders, and in ſeveral parts of Germany, and particularly in the duchies of Juliers and Bergen, where coals are uſed as fuel, the coals are always prepared before they are uſed, by pounding them to a powder, and mixing them up with an equal weight of clay, and a ſufficient quantity of water to form the whole into a maſs, which is kneaded together and formed into cakes; which cakes are afterwards well dried, and kept in a dry place for uſe. And it has been found, by long experience, that the expence attending this preparation is amply repaid by the improvement of the fuel. The coals, thus mixed with clay, not only burn longer, but give much more heat than when they are burnt in their crude ſtate.

It will doubtleſs appear extraordinary to thoſe who have not conſidered the ſubject with ſome attention, that the quantity of heat produced in the combuſtion of any given quantity of coals ſhould be increaſed by mixing the coals with clay, which is certainly an incombuſtible body; but the phenomenon may be explained in a ſatisfactory manner.

The heat generated in the combuſtion of any ſmall particle of coal exiſting under two diſtinct forms, namely, in that which is combined with the flame and ſmoke which riſe from the fire, and which, if means are not found to ſtop it, goes off immediately by the chimney and is loſt; and the radiant heat which is ſent off from the fire in all directions in right lines:—It is therefore reaſonable to conclude, that the particles of clay, which are ſurrounded on all ſides by the flame, arreſt a part at leaſt of the combined heat, and prevent its eſcape; and this combined heat, ſo arreſted, heating the clay red hot, is retained in it, and being changed by this operation to radiant heat, is afterwards emitted, and may be directed and employed to uſeful purpoſes. In the compoſition of fire balls, the Count thinks it probable that a certain proportion of chaff, of ſtraw cut very fine, or even of ſaw-duſt, might be employed with great advantage.

Fulling. FULLING OF WOOLLEN CLOTHS (ſee the method of performing the operation under the article FULLING, *Encycl.*) depends, like FELTING, ſo entirely upon the ſtructure of wool and hair, that the following obſervations, which are not unimportant, will be intelligible to every reader who has peruſed that article in this *Supplement.*

The aſperities with which the ſurface of wool is every where ſurrounded, and the diſpoſition which it has to aſſume a progreſſive motion towards the root, render the ſpinning of wool, and making it into cloth, difficult operations. In order to ſpin wool, and afterwards to weave it, we are obliged to cover its fibres with a coating of oil, which, filling the cavities, renders the aſperities leſs ſenſible; in the ſame way as oil, when rubbed over the ſurface of a very fine file, renders it ſtill leſs rough. When the piece of cloth is finiſhed, it muſt be cleanſed from this oil; which, beſides giving it a diſagreeable ſmell, would cauſe it to ſoil whatever it came in contact with, and would prevent its taking the colour which is intended to be given to it by the dyer. To deprive it of the oil, it is carried to the fulling-mill, where it is beat with hammers in a trough full of water, in which ſome clay has been mixed; the clay combines with the oil, which it ſeparates from the cloth, and both together are waſhed away by the freſh water which is brought to it by the machine; thus, after a certain time, the oil is entirely waſhed out of the cloth.

But the ſcouring of the cloth is not the only object in fulling it; the alternate preſſure given by the mallets to the piece of cloth, occaſions, eſpecially when the ſcouring is pretty far advanced, an effect analogous to that which is produced upon hats by the hands of the hatter; the fibres of wool which compoſe one of the threads, whether of the warp or the woof, aſſume a progreſſive movement, introduce themſelves among thoſe of the threads neareſt to them, then into thoſe which follow; and thus, by degrees, all the threads, both of the warp and the woof become felted together. The cloth, after having, by the above means, become ſhortened in all its dimenſions, partakes both of the nature of cloth and of that of felt; it may be cut without being ſubject to ravel, and, on that account, we are not obliged to hem the edges of the pieces of which clothes are made. Laſtly, As the threads of the warp and thoſe of the woof are no longer ſo diſtinct and ſeparated from each other, the cloth, which has acquired a greater degree of thickneſs, forms a warmer clothing. Knit worſted alſo is, by fulling, rendered leſs apt to run, in caſe a ſtitch ſhould drop in it.

FULMINATING GOLD. } See CHEMISTRY *Suppl.*
FULMINATING Silver. } nos 849 and 850.

Mr Berthollett, the inventor of fulminating ſilver, having contented himſelf with a general and conciſe deſcription of this ſubject, many practical chemiſts have failed in their attempts to prepare it; and others, forming their opinions from the ſpecimens which they had made, have been expoſed to great danger: as will appear from the following relation:

An ounce of fine ſilver was diſſolved in the courſe of eight hours in an ounce of pure nitrous acid, of the London Pharmacopœia, diluted previouſly with three ounces of diſtilled water in a glaſs matraſs. The ſolution being poured off, the reſiduary black powder and the matraſs were waſhed with ſeven or eight ounces of warm diſtilled water, and this was added to the ſolution. The black powder, being gold, was rejected; ſome gold being thus ſeparable from any ſilver of commerce.

To the foregoing diluted ſolution, pure lime-water prepared with diſtilled water was added gradually; for the ſolution ought not to be poured into the lime water. When about thirty pints of lime-water had been expended, and the precipitate had ſubſided, more lime-water was added, by ſucceſſive pints, as long as it cauſed any precipitation. For it was deemed fitter that the precipitation ſhould not be perfected, than that an exceſs of lime-water ſhould be uſed; the earthy pellicle of the exceſſive lime-water being apt to mix with the precipitate. The clear liquor being poured away, the precipitate was poured off, and waſhed into a filter.

When the ſaline liquor had drained from it, two ounces of diſtilled water were poured on the magma; and when this water had paſſed, freſh portions were ſucceſſively added and paſſed, until the whole quantity of water thus expended in waſhing away the nitrous calcareous ſalt amounted to a quart.

The filter being then unfolded, to let the magma of oxyd of ſilver ſpread on the flattened paper, it was placed on a chalk-ſtone to accelerate the exſiccation, and was gradually dried in the open air; a cap of paper being placed looſely over it to exclude the duſt.

When the weather ſerved, the cap was removed, to expoſe the oxyd to the rays of the ſun; although this was not deemed necceſſary; and exſiccation was promoted by cutting the oxyd into thin ſlices. When perfectly dry it weighed 1 oz. 4 dwts. and about one-fifth of it was conſidered as oxygen.

When aqua ammoniæ puræ of any pharmacopœia is uſed with this oxyd, either in the ſmall quantity which blackens it completely, or in a greater quantity, the black matter which ſubſides, and which has been repreſented by ſyſtematic writers as the fulminating compound, has no ſuch property, any farther than may be owing to the matter depoſited from the alkaline ſolution during the exſiccation.

The alkaline liquor containing the fulminating ſilver ought to be poured off from the inſoluble powder, and expoſed in a ſhallow veſſel to the air. In conſequence of the exhalation, black ſhining cryſtals form on the ſurface only, and ſoon join to form a pellicle. As this pellicle adheres a little to the ſides of the veſſel, or maintains its figure, the liquor may be poured off by a gentle inclination of the veſſel.

This liquor will yield another pellicle in the ſame way; but the third or fourth pellicle will be paler than the former, and weaker in the exploſion. The firſt pellicles, when ſlowly dried, explode by the touch of a feather, or by their being heated to about 96°.

The quantity of water in the ordinary aqua ammoniæ puræ renders it leſs active in the ſolution of the oxyd, and is an impediment to the ſpeedy formation and ſeparation of the fulminating ſilver; and an experimenter who has often uſed twenty grains of the oxyd to produce ſucceſſive pellicles of fulminating ſilver, which may be ſeparately exploded with ſafety, and who has perceived that the pellicles never explode whilſt wet, if they be not heated, would, in all probability, reſolve on the following improvement, and expoſe himſelf to the unforeſeen danger of it.

Diſtilled water was impregnated with as much pure ammoniac, as it could eaſily retain under the ordinary temperature of the air. A quantity of this ſtrong ammoniacal liquor, equal in bulk to a quarter of an ounce of water, was placed in a ſmall bottle, and 24 grains of the oxyd of ſilver, ground to fine powder, were added. The bottle, being almoſt filled, was corked, to prevent the formation of that film which uſually appeared in conſequence of the exhalation of the ammoniac in other experiments.

During the ſolution of the oxyd, bubbles of the gaſeous kind aroſe from it, and the ſolution acquired a blue colour. As no film appeared, the bottle was agitated three or four times in the courſe of as many hours, in order to promote the ſolution of a ſmall quantity of blackened oxyd which remained at the bottom. The experimenter conſidering this as an ample proviſion for twenty different charges, to be exploded in different circumſtances, in the preſence of the ſociety, intended to pour off the ſolution into as many ſmall veſſels, and to weigh the reſiduary black powder, after allowing two hours more for the ſolution.

On the ſixth hour he took his uſual precaution of wearing ſpectacles; and obſerving that a ſmall quantity of black powder ſtill remained undiſſolved, and that no film was yet formed at the ſurface, he took the bottle by the neck to ſhake it, knowing that it might explode by the heat of his hand, if he were to graſp it, and that the exploſion in this circumſtance might wound him dangerouſly.

In the inſtant of ſhaking, it exploded with a report that ſtunned him. The bottle was blown into fragments ſo ſmall as to appear like glaſs coarſely powdered. The hand which held it was impreſſed as by the blow of a great hammer, and loſt the ſenſe of feeling for ſome ſeconds; and about 52 ſmall grains of glaſs were lodged, many of them deeply, in the ſkin of the palm and fingers. The liquor ſtained his whole dreſs, and every part of the ſkin that it touched. Thus it appeared that fulminating ſilver may be made which will explode even when cold and wet, by the mere diſturbance of the arrangement of its parts, in the aqueous fluid.

In ſubſequent experiments, privately and carefully conducted, it ſeemed that the property of exploding in the cold liquor, by mere commotion, depended on the unuſual quantity or proximity of the exploſive molecules in a given bulk of the liquor. And the flat bottoms, as well as the ſides, of the thick veſſels of glaſs or potters-

Function || Fundy.

Fundy || Fuſt.

ters-ware, whether they ſtood on boards or iron plates, were always beaten to ſmall fragments.

This afforded a curious inſtance of the poſſible equilibrium between the powers tending to retain the caloric and thoſe which effect the expulſion of it; and experiments and conſiderations of this kind ſeemed to promiſe a true ſolution of the phenomena of Rupert's drops.

FUNCTION, a term uſed in analytics for an algebraical expreſſion any how compounded of a certain letter or quantity with other quantities or numbers; and the expreſſion is ſaid to be a function of that letter or quantity. Thus $a - 4x$, or $ax + 3x^2$, or $2x - a\sqrt{a^2 - x^2}$, or x^c, or c^x, is each of them a function of the quantity x.

FUNDY, a large bay in N. America, which opens between the iſlands in Penobſcot bay, in Lincoln co. Maine, and Cape Sable, the S. weſtern point of Nova-Scotia. It extends about 200 miles in a N. E. direction; and with Verte bay, which puſhes into the land in a S. W. direction from the ſtraits of Northumberland, forms a very narrow iſthmus, which unites Nova-Scotia to the continent; and where the diviſion line runs between that province and New-Brunſwick. From its mouth up to Paſſamaquoddy bay, on its N. W. ſide, ſituated between the province of New-Brunſwick and the diſtrict of Maine, are a number of bays and iſlands on both ſides, and thus far it contracts its breadth gradually. It is 12 leagues acroſs from St John's, in New-Brunſwick, to the Gut of Annapolis, in Nov-Scotia; where the tides are rapid, and riſe 30 feet. Above this it preſerves nearly an equal breadth, until its waters are formed into two arms, by a peninſula, the weſtern point of which is called Cape Chignecto. At the head of the N. eaſtern arm, called Chignecto channel, which, with bay Verte forms the iſthmus, the tides riſe 60 feet. In the Baſin of Minas, which is the E. arm or branch of this bay, the tides riſe 40 feet. Theſe tides are ſo rapid as to overtake animals feeding on the ſhore.—*Morſe.*

FURD-Y-HUCKEECUT, in Bengal, ſignifies a paper of deſcription.

Furd-y-Sowal, paper of requeſt.

FUST, in architecture, the ſhaft of a column, or the part comprehended between the baſe and the capital, called alſo the naked.

G.

Gabori || Gaguedi.

Gaguedi || Galette.

GABORI, a bay on the S. E. coaſt of Cape Breton iſland. The entrance into it, which is not more than 20 leagues from the iſles of St. Pierre, is between iſlands and rocks about a league in breadth. The bay is 2 leagues deep, and affords good anchorage.—*Morſe.*

GABRIEL, St an iſland in the great river La Plata, S. America, diſcovered by Sebaſtian Cabot, in the year 1526.—*ib.*

GAGE's *Town*, a ſettlement in Sunbury co. New-Brunſwick; on the lands granted to general Gage, on the W. ſide of St John's river, on the northern ſhore of the bay of Fundy. The general's grant conſiſts of 20,000 acres of land; the up-land of which is in general very bad. There is ſome intervale on the river ſide, on which are a few ſettlers; excluſive of theſe ſettlements, there is very little good land of any kind.—*ib.*

GAGUEDI, a tree peculiar to Lamalmon, in Abyſſinia, is thus deſcribed by Mr Bruce. The leaves are long, and broader as they approach the end. The point is obtuſe. They are of a dead green, not unlike the willow, and placed alternately one above the other on the ſtalk. The calix is compoſed of many broad ſcales lying one above the other, which operates by the preſſure upon one another, and keeps the calix ſhut before the flower arrives at perfection. The flower is monopetolous, or made of one leaf; it is divided at the top into four ſegments; where theſe end, it is covered with a tuft of down, reſembling hair, and this is the caſe at the top alſo. When the flower is young and unripe, they are laid regularly ſo as to incloſe one another in a circle. As they grow old and expand, they ſeem to loſe their regular form, and become more confuſed, till at laſt, when arrived at its full perfection, they range themſelves parallel to the lips of the calix, and perpendicular to the ſtamina, in the ſame order as a roſe. The common receptacle of the flower is oblong, and very capacious, of a yellow colour, and covered with ſmall leaves like hair. The ſtile is plain, ſimple, and upright, and covered at the bottom with a tuft of down, and is below the common receptacle of the flower.

Our author ſays that he has obſerved, in the middle of a very hot day, that the flowers unbend themſelves more, the calix ſeems to expand, and the whole flower to turn itſelf towards the ſun in the ſame manner as does the ſun-flower. When the branch is cut, the flower dries, as it were inſtantaneouſly, ſo that it ſeems to contain very little humidity.

GALEN, a military townſhip in the ſtate of New-York, ſituated on Canadaque creek, 12 miles N. W. of the N. end of Cayuga lake, and 13 S. by E. of Great Sodus. It is bounded S. by Junius.—*Morſe.*

GALETS, an iſland at the E. end of lake Ontario, and in the ſtate of New-York, 5 miles S. weſtward of Roebuck iſland, 5 northerly of Point Gaverſe, and 31 S. E. of Point au Goelans.—*ib.*

GALETTE, LA, a neck of land in the river St. Lawrence, in Canada. From the point oppoſite to l'iſle de Montreal, a road might be made to Galette, ſo as to ſave 40 leagues of navigation, which the falls render almoſt impracticable, and always very tedious. The land about La Galette is very good; and in two days time a barque may ſail thence to Niagara, with a good wind. La Galette is a league and a half above the fall called les Galots.—*ib.*

GALIBIS, or *Charaibes*, a nation of Indians inhabiting near New-Andaluſia, in S. America; from which the Charaibes of the Weſt-Indies are thought to be deſcended.—*ib.*

GALICIA, an audience in Old Mexico or New-Spain, containing 7 provinces. Guadalaxera is the capital city.—*ib.*

GALIPAGO *Iſles*, the name of ſeveral uninhabited iſles in the South Sea, on both ſides the equator, not far from the coaſt of Terra Firma; belonging to Spain. They lie between 3. N. and 4. S. lat. and between 83. 40. and 89. 30. W. long. There are only 9 of them of any conſiderable ſize; ſome of which are 7 or 8 leagues long, and 3 or 4 broad. Dampier ſaw 14 or 15 of them. The chief of theſe are Norfolk, neareſt the continent, Wenmore among the N. weſternmoſt and Albemarle the weſternmoſt of all. A number of ſmall iſles lie W. from theſe, on both ſides the equator; one of which, Gallego iſland lies in the 1ſt degree of N. lat. and 102 of W. long. Many of theſe iſles are well wooded, and ſome have a deep black mould. Vaſt quantities of the fineſt turtle are to be found among theſe iſlands, where they live the greateſt part of the year; yet they are ſaid to go from thence over to the main to lay their eggs, which is at leaſt 100 leagues diſtant.—*ib.*

GALLAN, St a ſmall iſland on the coaſt of Peru, in lat. 14. S. 5 miles N. of the high land *Morro Veijo*, or Old Man's Head; between which iſland and the high land, is a moſt elegible ſtation to cruize for veſſels bound for Callao, N. or S.—*ib.*

GALLIOPOLIS, a poſt town in the N. W. territory, ſituated on a bend of the Ohio, and nearly oppoſite to the mouth of the Great Kanhaway. It is ſaid to contain about 100 houſes, all inhabited by French people. It is 140 miles eaſtward of Columbia, 300 S. W. of Pittſburg, and 559 S. W. of Philadelphia. N. lat. 39. 2. W. long 83. 9.

This town is ſaid to be on the decline, their right to the lands not being ſufficiently ſecured.—*ib.*

GALOTS, the loweſt of the falls on the river St Lawrence in Canada. Between the neck of land la Galette and les Galots is an excellent country, and no where can there be ſeen finer foreſts.—*ib.*

GALOTS, L'ISLE AUX, an iſland in the river St Lawrence, in Canada; 3 leagues beyond l'iſle aux Chevres, in N. lat. 43. 33.—*ib.*

GALLO, an iſland in the province of Popayan, S. America, in N. lat. 2. 40. Captain Dampier ſays it is ſituated in a deep bay, and that off this iſland there is not above 4 or 5 fathom water; but at Segnetta, which is on the N. ſide, a veſſel may ride in deep water, free from any danger. The iſland is high, provided with wood and good water, and having good ſandy bays, where a ſhip may be cleaned.——Alſo, the name of an iſland of the S. ſea, near the coaſt of Peru, which was the firſt place poſſeſſed by the Spaniards, when they attempted the conqueſt of Peru.—*ib.*

GALLOWAY, a townſhip in Glouceſter co. New-Jerſey.—*ib.*

GALVANISM.

1 Galvaniſm improperly called *animal electricity*.

GALVANISM, is the name now commonly given to the influence diſcovered nearly eight years ago by the celebrated Galvani, profeſſor of anatomy at Bologna, and which, by him and ſome other authors, has been called *animal electricity*. We prefer the former name, becauſe we think it by no means proved, that the phenomena diſcovered by Galvani depend either upon the electric fluid, or upon any law of animal life. While that is the caſe, it is ſurely better to diſtinguiſh a new branch of ſcience by the name of the inventor, than to give it an appellation which probably may, and, in our opinion, certainly does, lead to an erroneous theory.

2 Diſcovery of galvaniſm.

M. Galvani was engaged in a ſet of experiments, the object of which was to demonſtrate, if poſſible, the dependence of muſcular motion upon electricity. In the courſe of this inveſtigation, he had met with ſeveral new and ſtriking appearances which were certainly electrical; ſoon after which, a fortunate accident led to the diſcovery of the phenomena which conſtitute the chief ſubject of this article. The ſtrong reſemblance which theſe bore to the electrical facts which he had before obſerved, led almoſt irreſiſtibly to the concluſion that they all depended upon the ſame cauſe. This opinion he immediately adopted; and his ſubſequent experiments and reaſonings were naturally directed to ſupport it. The ſplendor of his diſcovery dazzled the imaginations of thoſe who proſecuted the enquiry; and for ſome time his theory, in ſo far at leaſt as it attributed the whole to the agency of the electric fluid, was ſanctioned by univerſal approbation. Of late, however, this opinion has rather loſt ground; and there are now many philoſophers who conſider the phenomena as totally unconnected with electricity.

3 Object of this article

We propoſe, in the *firſt* place, to enumerate the chief facts which have been aſcertained on the ſubject; we ſhall then enquire, whether or not the cauſe of the appearances be the electric fluid; and, *thirdly*, we ſhall examine how far it has been proved, that this cauſe is neceſſarily connected with animal life.

Whilſt Galvani was one day employed in diſſecting a frog, in a room where ſome of his friends were amuſing themſelves with electrical experiments, one of them having happened to draw a ſpark from the conductor at the ſame time that the profeſſor touched one of the nerves of the animal, its whole body was inſtantly ſhaken by a violent convulſion. Aſtoniſhed at the phenomenon, and at firſt imagining that it might be owing to his having wounded the nerve, he pricked it with the point of his knife, to aſſure himſelf whether or not this was the caſe, but no motion of the frog's body was produced. He now touched the nerve with the inſtrument as at firſt, and directed a ſpark to be taken at the ſame time from the machine, on which the contractions were renewed. Upon a third trial, the animal remained motionleſs; but obſerving that he held his knife by the handle, which was made of ivory, he changed it for a metallic one, and immediately the movements took place, which never was the caſe when he uſed an electric ſubſtance.

After having made a great many ſimilar experiments with the electrical machine, he reſolved to proſecute the ſubject with atmoſpheric electricity. With this view he raiſed a conductor on the roof of his houſe, from which he brought an iron wire into his room. To this he attached metal conductors, connected with the nerves of the animals deſtined to be the ſubjects of his experiments; and to their legs he faſtened wires which reached the floor. Theſe experiments were not confined to frogs alone. Different animals, both of cold and warm blood, were ſubjected to them; and in all of them conſiderable movements were excited whenever it lightned. Theſe preceded thunder, and correſponded with its intenſity and repetition; and even when no lightning appeared, the movements took place when any ſtormy cloud paſſed over the apparatus. That all theſe appearances were produced by the electric fluid, was obvious.

Having ſoon after this ſuſpended ſome frogs from the iron paliſades which ſurrounded his garden, by means of metallic hooks fixed in the ſpines of their backs, he obſerved that their muſcles contracted frequently and involuntarily as if from a ſhock of electricity. Not doubting that the contractions depended on the electric fluid, he at firſt ſuſpected that they were connected with changes in the ſtate of the atmoſphere. He ſoon found, however, that this was not the caſe; and having varied, in many different ways, the circumſtances in which the frogs were placed, he at length diſcovered that he could produce the movements at pleaſure by touching the animals with two different metals, which, at the ſame time, touched one another either immediately or by the intervention of ſome other ſubſtance capable of conducting electricity.

All the experiments that have yet been made may be reduced to the following, which will give the otherwiſe uninformed reader a preciſe notion of the ſubject.

Lay bare about an inch of a great nerve, leading to any limb or muſcle. Let that end of the bared part which is fartheſt from the limb be in cloſe contact with a bit of zinc. Touch the zinc with a bit of ſilver, while another part of the ſilver touches, either the naked nerve, if not dry, or, whether it be dry or not, the limb or muſcle to which it leads. Violent contractions are produced in the limb or muſcle, but not in any muſcle on the other ſide of the zinc.

Or, touch the bared nerve with a piece of zinc, and touch, with a piece of ſilver, either the bared nerve, or the limb; no convulſion is obſerved, till the zinc and ſilver are alſo made to touch each other.

4
Has engaged much ſcientific attention.

A fact ſo new, illuſtrated by many experiments and much ingenious reaſoning, which Profeſſor Galvani ſoon publiſhed, could not fail to attract the attention of phyſiologiſts all over Europe; and the reſult of a vaſt number of experiments, equally cruel and ſurpriſing, has been from time to time laid before the public by Valli, Fowler, Monro, Volta, Humboldt, and others.

Frogs, unhappily for themſelves, have been found the moſt convenient ſubjects for theſe experiments, as they retain their muſcular irritability and ſuſceptibility of the galvanic influence very long. Many hours after they have been decapitated, or have had their brain and ſpinal marrow deſtroyed, ſtrong convulſions can be produced in them by the application of the metals. A leg ſeparated from the body will often continue capable of excitement for ſeveral days. Nay, very diſtinct movements have been produced in frogs pretty far advanced in the proceſs of putrefaction. Different kinds of fiſhes, and many other animals both of cold and warm blood, have been ſubjected to ſimilar experiments, and have exhibited the ſame phenomena; but the warm blooded animals loſe their ſuſceptibility of galvaniſm, as of every other ſtimulus, very ſoon after death.

5
The metals.

Almoſt any two metals will produce the movements; but, it is believed, the moſt powerful are the following, in the order in which they are here placed: 1. Zinc; 2. Tin; 3. Lead; in conjunction with, 1. Gold; 2. Silver; 3. Molybdena; 4. Steel; 5. Copper. Upon this point, however, authors are not perfectly agreed.

6
Animal and excitatory arcs.

The proceſs by which theſe ſingular phenomena are produced, conſiſts in effecting, by the uſe of the exciting apparatus, a mutual communication between any two points of contact, more or leſs diſtant from one another, in a ſyſtem of nervous and muſcular organs. The ſphere of this mutual communication may be regarded as a complete circle, divided into two parts. That part of it which conſiſts of the organs of the animal under the experiment, has been called *the animal arc*; that which is formed by the galvanic inſtruments has been called *the excitatory arc*. The latter uſually conſiſts of more pieces than one; of which ſome are named *ſtays*, *braces*, &c. others *communicators*, from their reſpective uſes.

7
Experiments of the French Inſtitute.

A very numerous train of experiments on galvaniſm has been made by a committee of the Phyſical and Mathematical Claſs of the National Inſtitute of France; and as their report comprehends a vaſt number of the moſt important facts which are yet known on the ſubject, we ſhall preſent our readers with the ſubſtance of it (A).

The immenſe maſs of matter which reſulted from the experiments of the committee, is, in their report, preſented, not in the order in which the experiments were made, but in a ſort of claſſification, by means of which a more diſtinct knowledge of the ſubject is obtained at one view. The facts are arranged under theſe ſix heads. *1ſt*, Reſults of the different combinations and diſpoſitions of the parts of the *animal arc*. *2d*, Account of what has been obſerved of the nature and the different diſpoſitions of the *excitatory arc*. *3d*, Circumſtances not entering into the compoſition of the galvanic circle, which, nevertheleſs, by their influence, modify, alter, or entirely prevent the ſucceſs of the experiments. *4th*, Means propoſed for varying, diminiſhing, or reſtoring the ſenſibility to galvaniſm. *5th*, Attempts to compare the

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(A) The members of the committee were, M. M. Coulomb, Sabbatier, Pelletan, Charles, Fourcroy, Vauquelin, Guyton, *alias* Morveau, and Hallé. M. M. Venturi, De Modene, and M. Humboldt, aſſiſted in the experiment.

the phenomena of galvaniſm with thoſe of electricity. *6th*, Additional experiments, performed by M. Humboldt, in the preſence of the members of the committee; which have a reference to ſeveral of the proofs ſtated in the foregoing articles.

8 On the animal arc.

I. To the number of twenty experiments were made on the *animal arc*. The firſt ſeven of theſe were directed to aſcertain the relations between the nerves and thoſe muſcles over which they are diſtributed. In the laſt thirteen, the nerves were cut aſunder, or ſubjected to ligatures; the ſection or ligature being always between the extremities of the arc. Nerves taken from different animals, or from different parts of the ſame animal, and joined in one and the ſame arc, were among the particular ſubjects of theſe experiments; as were alſo the ſolitary nerve, and the ſolitary muſcle, included between the extremities of the *excitatory arc*. There were interpoſed, too, in the courſe of theſe experiments, portions of nerves, and of muſcles, diſtinct from thoſe parts. And, in ſome of the experiments, the animal was without the ſkin and the epidermis.

The following are inferences which have been deduced from theſe experiments:

9 Inferences.

1. The animal arc may conſiſt either of nerves and muſcles together, or of nerves alone, without muſcles. (B).

2. Nerves are, therefore, the eſſential part of the animal arc; for the muſcles are always more or leſs interſected by the nerves; and are, conſequently, in part, a nervous organ.

3. All the parts of the animal arc muſt be either mutually continuous, or at leaſt contiguous to one another. But even contiguity is ſufficient to enable the galvanic phænomena to take place.

4. The ſection or ligature of a nerve interrupts not the galvanic phænomena, if the parts which are cut aſunder or bound up ſtill remain in cloſe contiguity to one another.

5. No diverſity of the parts forming the animal arc, though theſe be taken from different parts of the ſame animal, or even from different animals, will have power to impair its galvanic ſuſceptibility, provided only that theſe parts be ſtill mutually contiguous.

6. If the *integrity* or galvanic ſuſceptibility of the animal arc be ſuſpended by the ſeparation of any of its parts to ſome diſtance from one another, it may be reſtored by the interpoſition of ſome ſubſtances, not of an animal nature, between the divided parts. Metallic

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(B) We are ſtrongly inclined to doubt the truth of this propoſition. Dr Fowler was at firſt led to think that contractions could be excited in a limb without the metals having any communication with it, except through the medium of the nerve. Recollecting, however, that a very ſmall quantity of moiſture ſerves as a conductor of galvaniſm, he ſuſpected, and our opinion perfectly coincides with his, that in every caſe where contractions are produced in a limb, without any apparent communication between the metals and the muſcles, except through the medium of a nerve, the communication is in fact completed by the moiſture upon the ſurface of the nerve. In this caſe, the animal arc may be conſidered as conſiſting of three pieces, diſpoſed in the following order; the nerve, the muſcle, and the water adhering to the ſurface of the nerve. The latter, indeed, ought rather to be conſidered as a part of the excitatory arc. "When a nerve (ſays Dr Fowler,), which for ſome time has been detached from ſurrounding parts, is either carfully wiped quite dry with a piece of fine muſlin, or (leſt this ſhould be thought to injure its ſtructure) ſuffered to remain ſuſpended till its moiſture has evaporated, no contractions can be excited in the muſcles, to which it is diſtributed, by touching it alone with any two metals in contact with each other; but if it be again moiſtened with a few drops of water, contractions inſtantly take place. And, in this way, by alternately drying and moiſtening the nerve, contractions may at pleaſure be alternately ſuſpended and renewed for a conſiderable time. It may, indeed, be contended, that the moiſture ſoftened, and thus reſtored elaſticity and free expanſion to the dried cellular membrane ſurrounding the fibres, of which the trunk of a nerve is compoſed; and thus, by removing conſtraint, gave free play to their organization.

"But from obſerving, that in every other inſtance where contractions are produced by the mutual contact of the metals, a conducting ſubſtance is interpoſed between them and the muſcles as well as between them and the nerve; I think it would be unphiloſophical not to allow, that, in the inſtance in queſtion, the moiſture, adhering to the ſurface of the nerve, formed that requiſite communication between the metals and the muſcles." We know of no accurate experiment by which it has ever been ſhewn, that contractions can be produced in a limb without a communication being eſtabliſhed between the metals and nerve, and again between the muſcles and the metals, either directly, or through ſome medium capable of conducting galvaniſm.

To remove the only objection which can be made to Dr Fowler's experiment, and of which we have ſeen that he was himſelf aware, namely, that the nerve while dry is incapable of performing its functions, we repeated it in the following manner: A ſmall, but vigorous and lively, male frog was decapitated, and the ſciatic nerve being laid bare from the knee upwards, was cut through where it paſſes out of the pelvis. Fifteen minutes after the head was cut off, the nerve having been cautiouſly ſeparated from the ſurrounding parts, and coated with tinfoil in the uſual manner, a ſilver probe was applied to it and its coating, without any other communication with the muſcles, and ſtrong contractions took place in the leg. The nerve was now very carefully dried with a piece of fine linen, and the probe was applied as before to the tinfoil and the nerve; no movement whatever took place. Things remaining preciſely in this ſituation, one end of the probe being ſtill in contact with the nerve and its coating, the other end was applied to the muſcles of the thigh, and the leg immediately contracted as ſtrongly as ever. Upon moiſtening the nerve, the contractions were again produced by applying the probe to the nerve and tinfoil alone. We find from this experiment, which we have ſeveral times repeated with the utmoſt care, and with the ſame reſult, that the dry nerve retained its functions completely. This appears to us perfectly deciſive of the queſtion.

ſubſtances are in particular fit for this uſe. But the mutual contiguity of all the ſubſtances entering into the compoſition of the arc muſt ever be carefully preſerved. Mr Humboldt diſcovered that a bit of freſh morelle *Helvella mitra Linn.*) will ſupply the place of a part of the nerve.

7. The muſcular organs which indicate, by contraction, the preſence of the galvanic influence, are always thoſe in which the nerves of a complete animal arc have their ultimate termination.

From this it follows, that the muſcles affected by galvaniſm are always thoſe correſponding to that extremity of the arc which is the moſt remote from the origin of the nerves of which it is compoſed.

8. When all the nerves of the animal arc originate towards one of its extremities, then only thoſe muſcles which correſpond with the oppoſite extremity are ſuſceptible of galvanic convulſions.

9. When an animal arc conſiſts of more than one ſyſtem of different nerves, which have all their origin about the middle of the arc, then will the muſcles of theſe ſeveral ſyſtems of nerves be moved alike at both the extremities of the arc.

10. It ſeems likewiſe to appear, from a variety of theſe experiments, that the opinion of thoſe is inadmiſſible, who aſcribe the phænomena of galvaniſm to the concurrence of two different and reciprocally correſponding influences, one belonging to the nerve, the other to the muſcle, and who compare the relations between the nerve and the muſcle, in theſe phænomena, to thoſe between the interior and the exterior coating of the Leyden phial.

11. It appears, laſtly, that the covering of the epidermis, in the entire animal body, acts as an obſtacle to the deciſive diſplay of the effects of galvaniſm; and that, though from its extreme tenuity, it may not altogether prevent theſe effects, yet it cannot but very materially diminiſh them.

10
Experiments on the excitatory arc.

II. The *Excitatory Arc* is uſually formed of three different pieces made of different metals. Of theſe, one muſt be in contact with the nerve; the other muſt touch the muſcle; and the third muſt form the mean of communication between theſe two. This arrangement, though not indiſpenſably neceſſary, is at leaſt the moſt convenient.

In reſpect to the excitatory arc, the committee examined, 1ſt, The application of metallic ſubſtances to form it: in reſpect to which they endeavoured to aſcertain the number and the diverſity of the pieces of metal, of which this arc may be compoſed; the metallic mixtures or alloys which are capable of being employed for this uſe; the particular degree of the friction of one metal upon another, which is favourable to the exhibition of the phænomena, the different ſtates, in reſpect to galvaniſm, of metals differently mineralized. 2dly, The effects of the uſe of carbonic ſubſtances in forming the excitatory arc. 3dly, The effects in the ſame formation, of bodies, which are either non-conductors, or elſe very imperfect conductors of electricity, ſuch as jet, aſphaltus, ſulphur, amber, ſealing-wax, diamond, &c. 4thly, The conſequences of the interpoſition of water, and of ſubſtances moiſtened with water, between the different parts of the excitatory arc. In forming their excitatory arcs, too, they made themſelves the chord of the arc; they introduced into it animal ſubſtances which had loſt their vitality; they rubbed the ſupporters with the dry fingers, ſo as to mark them with nothing but the traces of the perſpiration from the ſkin. They made, likewiſe, ſome experiments for the purpoſe of aſcertaining the relations between, on the one hand, the extent and magnitude of the ſurfaces of the parts compoſing the arc, and on the other, the effects produced by its energy. From their experiments they have alſo drawn ſome inferences concerning the relative efficiencies of the ſeveral conſtituent parts of the exciting arc. It is impoſſible for us here to relate in detail all this train of experiments. The following corollaries expreſs the ſubſtance of thoſe general truths, which their authors were led to infer from them.

11
Inferences.

1. The excitatory arc poſſeſſes the greateſt power of galvaniſm, when it is compoſed of at leaſt three diſtinct pieces; each of a peculiar nature: the metals, water, and humid ſubſtances, carbonaceous matters, and animal ſubſtances, ſtripped of the epidermis, being the only materials out of which theſe pieces may be formed.

2. Nevertheleſs the excitatory arc appears to be not deſtitute of exciting energy, even when it conſiſts but of one piece or of ſeveral pieces, all of one proper ſubſtance (c). In general it muſt be owned, identity of nature in the conſtituent pieces, and particularly in the ſupports

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(c) We do not think it has ever been proved, that one piece of metal, or ſeveral pieces of the ſame metal, are capable of forming the excitatory arc. It is admitted on all hands, that the ſlighteſt alloy communicates galvanic energy to a piece of metal; that is, renders it capable of forming the excitatory arc. It is alſo known, that metallic oxyds are much leſs perfect conductors of galvaniſm than their correſponding reguli, to make uſe of an antiquated expreſſion. It appears to us, that in all caſes where one metal appears to act, more eſpecially where friction with the fingers, or breathing on a piece of metal formerly inert, give it galvanic powers; in all theſe caſes, we think it probable that a ſlight degree of oxydation, produced in ſome part of the ſurface of the metal, gives it activity by deſtroying the homogeneity of its nature. We do not find that this circumſtance has been in general ſufficiently attended to. Dr Wells having diſcovered that charcoal acts powerfully as an exciter when applied along with a metal, found that by friction it alſo can be rendered capable of acting ſingly. What change is thus produced in it we can only conjecture; but that it is ſomething which deſtroys the identity of its ſtructure, rendering it in ſome meaſure a heterogeneous ſubſtance, muſt be admitted.

Candour forces us to acknowledge, that in one of M. Humboldt's experiments, it ſeems very difficult to point out any want of homogeneity in the exciting arc. He put into a china cup ſome mercury exactly purified; he placed the whole near a warm ſtove, in order that the entire maſs might aſſume an equal temperature: the ſurface was clear, without the appearance of oxydation, humidity, or duſt. A thigh of a frog, prepared in ſuch a manner ſupports forming the extremities of the arc, diminiſhes, in a very ſenſible manner, its galvanic energy.

3. The ſlighteſt difference of nature induced upon the parts, whether by any feeble alloy, or by friction with extraneous ſubſtances, is at any time ſufficient to communicate to the excitatory arc that full power in which the identity of its compoſition may have made it defective.

4. As the animal arc is ſuſceptible of being in part made up of metallic ſubſtances, or ſuch others as are adapted to enter into the compoſition of the excitatory arc; ſo, on the other hand, the excitatory arc admits of being in part formed of thoſe ſubſtances which are the proper components of the animal arc.

5. The energies of both the excitatory and the animal arcs are alike ſuſpended by the ſeparation of their component parts, or at leaſt by the ſeparation of theſe parts to a certain diſtance.

6. Even the ſmalleſt degree of moiſture is ſufficient to join the parts of the excitatory arc, and to determine their effects upon the animal arc.

7. The influence of the ſtate of the atmoſphere, and of ſurrounding circumſtances, upon the ſucceſs of the experiments of galvaniſm, is, conſequently, very great. In order, therefore, to perform theſe experiments with due accuracy, the ſtate of the hygrometer, and of other meteorological inſtruments, muſt be vigilantly inſpected during their progreſs; and the influence of the perſons making the experiment upon the ſphere within which it is made, muſt likewiſe be carefully attended to.

8. The experiments which were made to aſcertain the nature of the animal arc, together with thoſe made upon the excitatory arc, with a view to the compariſon of the effects of the fleſh of animals, with or without the epidermis, and of the different effects of this epidermis, when it is wet, and when it is dry, appear to ſuggeſt to us, that the epidermis is one of thoſe ſubſtances which diminiſh or interrupt the efficacy of the excitatory arc. The epidermis is, as well as the hairs and briſtles of animal bodies, among the number of thoſe ſubſtances which deſerve the appellation of *idio-electrics*.

9. Examine the ſubſtances which are fit for the formation of the excitatory arc, and you will find that the greater part of thoſe which have been ſucceſsfully put to this uſe are ſubſtances capable of acting as conductors of the electrical fluid; but that the ſubſtances which interrupt the operation of galvaniſm are generally ſuch as are well known alſo to reſiſt the tranſmiſſion of electricity.

10. Laſtly, it appears, that the galvanic energy depends, not only upon the nature and arrangement of the component parts of the excitatory arc, but on their extent too, and on the magnitudes of their tranſmitting ſurfaces.

12
Experiments relating to circumſtances different from the arcs.

III. The committee appear to have uſed no leſs care and diſcernment in experiments upon thoſe circumſtances which, though different from the ſtructure of the galvanic circle and its two conſtituent arcs, have, however, *a deciſive influence upon the exhibition of the phænomena of galvaniſm*. Some curious obſervations were made on the differences in the ſtate of the parts expoſed to the galvanic action. It was aſcertained, that frogs freſh from the ditches did by no means exhibit the ſame phænomena as thoſe which had been during ſome days preſerved in the houſe; nor did the limbs of animals, when recently ſtripped of the ſkin, preſent the ſame appearances as after they had been ſubjected to a variety of galvanic experiments; nor were the ſame effects to be produced upon the parts of animal bodies which, after a certain number of trials, had been left for a while at reſt, and then taken up again, as upon thoſe which had been ſubjected to one continued train of experiments. The committee next examined the variations in the ſucceſs of the experiments upon a ſtrong lively frog, which may be produced by varying the mode in which the *communicator* is carried from the one *ſupporter* to the other: when the communicator is brought into contact with the ſupporter, or is withdrawn from actual contact with it; when the *communicator* is brought ſlowly, or when it is brought rapidly, into contact with the *ſupporter*; the effects are nearly the ſame: and a ſmart convulſion is, in all theſe caſes produced at the moment of the commencement of the mutual contact, or of its ceſſation. But when the frog is fatigued, the effects are different. Theſe ſucceſſive experiments likewiſe affect the reſults of one another, by means even of their ſucceſſion ſolely. And they are alſo naturally ſubject to be influenced by the nature of the media amidſt which they are performed; ſuch as common air, water, an electrical atmoſphere. The following are the inferences which have been deduced from this claſs of theſe experiments.

13
Inferences.

1. In many caſes the galvanic energy is excited by exerciſe, is exhauſted by continued motion, is renovated by reſt.

2. The multiplicity of the cauſes by which the experiments of galvaniſm are liable to be influenced to ſucceſs or failure, is ſo great, that we cannot, as yet, be too cautious in either rejecting or believing theſe accounts which we hear of the ſucceſs of any ſuch experiments; unleſs when we are able accurately to appreciate all the influencing circumſtances.

3. This is remarkably confirmed by a fact, which the committee have related in their paper, and which reſpects the continuation of the galvanic ſpaſm.

The communicator being ſupported by the hand, and reſting, ſeemingly, without change of poſition, ſtill upon

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a manner that a crural nerve and a bundle of muſcular fibres of the ſame length hung down ſeparately, was ſuſpended by two ſilken threads above the mercury. When the nerve alone touched the ſurface of the metal, no irritation was manifeſted; but as ſoon as the muſcular bundle and the nerve touched the mercury together, they fell into convulſions ſo briſk, that the ſkin was extended as in an attack of tetanus. This is by far the moſt deciſive experiment which has been tried on the ſame ſide of the queſtion; but as it muſt be admitted, that in moſt caſes two metals are abſolutely neceſſary, and that a ſingle metal often derives activity from circumſtances ſo ſlight, that we could not *a priori* have expected that they were capable of producing any change; we feel ourſelves compelled to conclude, that in M. Humboldt's experiment ſome ſimilar very ſlight circumſtance had eſcaped unobſerved; perhaps ſome gilding, or ornaments with metallic colours, in a ſtate of oxydation.

upon the ſame point of contact, there is known to take place a real change in the galvanic contact, although the communicator have remained thus apparently motionleſs.

From this, it may be farther inferred, that the ſmalleſt poſſible change in the relative ſituations of the parts of the galvanic circle and the excitatory arc, is capable of producing an effect upon the ſuſceptible animal, and of occaſioning miſtakes in regard to the ſucceſs of the experiment, if the utmoſt care be not taken to notice and eſtimate every variation that can happen.

4. The truth of the foregoing propoſition is farther confirmed by the experiments upon the manner in which the galvanic movements are affected by the advancing or the withdrawing of the communicator. For theſe experiments fully evince the neceſſity for the moſt vigilant obſervation of every movement in the proceſs of an experiment, not only collectively, but in their ſucceſſion, and at the different periods of the operation.

5. It ſhould ſeem that there are, in the formation of the excitatory arc, independently of its modes of acting in the galvanic operations, certain enervating, and certain exciting diſpoſitions; of which ſome not only augment or diminiſh the energy in the preſent inſtance, but, beſides, diſpoſe the animal to a greater or a ſmaller ſuſceptibility, under ſubſequent experiments.

6. In order to accuracy of experiment, and to the correct aſcertaining of the effects of an experiment, it is of great importance to know the preciſe ſtate of the animal, the manner in which it has been preſerved and ſuſtained to the preſent moment, the ſtate of the atmoſphere, particularly as it is indicated by the hygrometer, by the barometer, the thermometer, and the electrometer.

7. It were to be wiſhed, that in making a ſtatement of experiments of different ſorts, theſe ſhould be arranged in the order of their efficacy, and that there might thus be formed a *galvanic ſcale*, which ſhould help us to determine the preciſe degree of the galvanic ſuſceptibility of any animal in this or that particular ſtate or poſition, ſhould direct us in ſubjecting every ſuch animal only to experiments ſuitable to its particular ſuſceptibility; ſhould enable us to eſtimate, from the *efficacy* or *inefficacy* of our experiments, the galvanic value of the circumſtances in which we every day find ourſelves, and ſhould enable us to judge when the ſucceſs or miſcarriage of an experiment can afford room for certain concluſions abſolutely negative or affirmative.

14
Experiments on the galvanic ſuſceptibility of animal bodies, &c.

IV. In their experiments upon *the means of varying, diminiſhing, and renewing the ſuſceptibility of animal bodies* to the influence of galvaniſm, the committee examined, 1ſt, the influence of electricity upon that ſuſceptibility; 2d, the effects of the muſcular organs, and of certain liquors, ſuch as alcohol, the oxygenated muriatic acid, the ſolutions of potaſh and opium, upon the galvanic properties; 3d, and at the medical ſchool of Paris they made a number of experiments, in order to aſcertain what new modifications the galvanic energy undergoes in various caſes of ſuffocation or aſphyxia. Theſe laſt-mentioned experiments were made upon hot-blooded animals, of which ſome were reduced into the ſtate of aſphyxia by ſubmerſion, ſome by ſtrangulation, ſome by the action of gaſes, while others were killed *in vacuo* by the diſcharge of the electric ſpark. In that ſuffocation which was produced by ſulphurated hydrogenous gas, by carbonic vapours, and by ſubmerſion, in which the animal was ſuſpended by the hinder feet, the galvanic ſuſceptibility was entirely deſtroyed. The galvanic ſuſceptibility was only ſuſpended by ſuffocation produced by the pure carbonic acid confined under mercury. It was diminiſhed, but not deſtroyed, in thoſe caſes of ſuffocation, which were occaſioned by ſulphurated hydrogenous gas that had loſt a portion of its ſulphur by gas ammoniac, gas azote, or ſuch gaſes as had been exhauſted of their pure air by reſpiration; and the ſame thing was found to take place in animals which had periſhed by total ſubmerſion. But the galvanic ſuſceptibility ſurvived unaltered in ſuffocations brought on by ſubmerſion in mercury, by pure hydrogenous gas, by carbonated hydrogenous gas, by oxygenated muriatic acid, by ſulphureous acid; as alſo when the ſuffocation was occaſioned by ſtrangulation, by the abſtraction of the air in the air-pump, or by diſcharges from an electrical battery. The reſults of the experiments at the medical ſchool ſuggeſted the following reflections:

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Reflections

1. Though it be true that all caſes of ſuffocation reſemble one another in the privation of reſpirable air, and in the ſuſpenſion of the functions of reſpiration, and of the circulation of the blood; yet, in their other circumſtances, they are ſubject to great differences, ariſing from diverſity of nature in the ſubſtances by which they are occaſioned.

2. Of theſe cauſes, ſome appear to act with a more thorough efficacy, penetrating at once all parts of the nervous and muſcular ſyſtems. Others again ſeem to act but ſuperficially, producing only pulmonary aſphyxia, with its immediate effects.

3. One of the moſt remarkable changes not confined to the organs of reſpiration, conſiſts in the alterations produced on the galvanic ſuſceptibility. In that reſpect the various caſes of aſphyxia differ greatly one from another.

4. The ſtate of the irritability of the muſcles, when examined by means of bodies, the mechanical action of which cauſes the muſcles to contract by irritating them, is far from always correſponding to the ſtate of their galvanic ſuſceptibility.

5. Laſtly, the cauſes of ſuffocation or aſphyxia, do not act upon all parts of the muſcular ſyſtem in the ſame manner; but the heart is very often found in a ſtate extremely different from that of the other muſcles.

16
Compariſon of the phenomena of galvaniſm with thoſe of electricity.

V. *The compariſon between the phænomena of galvaniſm and thoſe of electricity* is perhaps one of the moſt intereſting objects of attention in the whole body of animal phyſiology. It is well known that Galvani was accidentally led to his diſcovery by obſerving the motions of ſome frogs, at a certain diſtance from an electrical machine diſcharging ſparks. The committee from the inſtitute made, therefore, ſome attempts to aſcertain the relations between electricity and galvaniſm. Having firſt paid due attention to the ſuſceptibility of animals toward the influence of electricity, they then ſought to diſcover to what preciſe degree animals diveſted of the natural covering of the epidermis were liable to be affected by the variations of the electrical fluid in the atmoſphere around them. Next, comparing the ſuſceptibility of electricity with the ſuſceptibility of galvaniſm, they perceived that quantities of the electrical fluid, ſuch as are ſtill capable of being very accurately meaſured by the electrometer, are, however, often too weak to act upon a frog that retains the moſt perfect ſenſibility to all the energy of galvaniſm. The members of the committee purpoſe to proſecute farther their experiments upon this part of the ſubject.

17
Reſults of ſome experiments by Humboldt.

VI. The following are the general reſults of the experiments made by M. Humboldt in the preſence of the committee:

1. There is no truth in the aſſertion of certain phyſiologiſts, that the experiments of galvaniſm fail when tried upon the heart and thoſe other muſcles of which the contractions depend not upon volition; for theſe organs have been found to be actually ſubject to the influence of galvaniſm (D).

2. The effects of galvaniſm are liable to be interrupted by the conſtriction of a nerve, whenever both the nerve and the conſtricting ligature are enveloped in the fleſh of the animal body (E).

3. The powers of the exciting arc may be renovated or deſtroyed, even though its ſupporters remain the ſame, and although the extremities of the arc be unchanged. Only the relations of the intermediate matters require to be altered.

4. There are atmoſpheres of galvaniſm.

5. There are ſubſtances which, though in an eminent manner conductors of electricity, yet interrupt the motions of galvaniſm.

M. Humboldt had performed alſo other experiments, which, when he attempted to repeat them before the committee, could not be brought to ſucceed, on account, as was ſuppoſed, of the ſeaſon of the year.

Such are the principal reſults of this valuable train of experiments upon galvaniſm. From them, our readers will perceive that this intereſting ſubject is ſtill very imperfectly underſtood, and will form ſome idea of the importance of the diſcoveries which a diligent proſecution of it promiſes to the philoſopher and the phyſician.

18
Effects of galvaniſm upon ſome of the organs of ſenſe.

The effects of galvaniſm upon ſome of the organs of ſenſe are no leſs ſtriking than thoſe which we have ſeen it capable of producing upon the muſcles.

If the upper and under ſurfaces of the tongue be coated with two different metals, and theſe be brought into contact with each other, a peculiar ſenſation, reſembling taſte, is produced in the tongue the moment that the metals touch each other. With the greater number of metals this ſenſation is ſcarcely perceptible; but with zinc and gold, zinc and ſilver, or zinc and molybdena, it is very ſtrong and diſagreeable. Dr Fowler thinks it is ſtrongeſt with zinc and gold; to us it appears a good deal ſtronger with zinc and ſilver. It is ſenſibly ſtronger when the zinc is applied to the upper, and the ſilver to the under ſurface of the tongue, than when this order is inverted. The ſenſation is moſt diſtinct when the tongue is of the ordinary temperature, and the metals of the ſame temperature with the tongue, Any conſiderable increaſe or diminution of heat in either greatly leſſens the effect. Mr Subſir of Berlin, in his *Théorie des Plaiſers*. p. 155 (publiſhed in 1767), takes notice of the diſagreeable taſte produced by ſilver and lead in contact upon the tongue. This is the firſt inſtance of galvaniſm that has been made public.

To enſure complete ſucceſs to the experiment, the metals ought to be allowed to remain ſome time in contact with the tongue before they are made to touch each other, that the taſte of the metals themſelves may not be confounded with the ſenſation produced by their mere contact. Whatever has a tendency to blunt the ſenſibility of the tongue, as opium, alcohol, acids, and the like, diminiſhes the effect of the metals.

It is difficult to deſcribe the ſenſation thus produced accurately. It has been called *ſubacid*; but we think it more nearly reſembles the effect produced by allowing a grain or two of nitre to lie upon the tongue for ſome time, than any other taſte with which we are acquainted. Joined to this, there is evidently a metallic taſte, which varies with the metal employed; but we are inclined to conſider this as the ordinary effect of the metals upon the tongue, which cannot be perfectly diſtinguiſhed from that occaſioned by their mutual contact.

This taſte can alſo be produced by applying one of the metals to the tongue, and the other to any part of the Schneiderian membrane. Profeſſor Robiſon has made many experiments of this kind, the reſult of which is contained in a letter to Dr Fowler. "I find (ſays he), that if a piece of zinc be applied to the tongue, and be in contact with a piece of ſilver which touches any part of the lining of the mouth, noſtrils, ear, urethra, or anus, the ſenſation reſembling taſte is felt on the tongue. If the experiment be inverted, by applying the ſilver to the tongue, the irritation produced by the zinc is not ſenſible, except in the mouth and the urethra, and is very ſlight. I find the irritation by the zinc ſtrongeſt when the contact is very ſlight, and confined to a narrow ſpace, and when the contact of the ſilver is very extenſive, as when the tongue is applied to the cavity of a ſilver ſpoon. When the zinc touches in an extenſive ſurface, the irritation produced by a narrow contact of the ſilver is very diſtinct, eſpecially on the upper ſide of the tongue, and along its margin. This irritation ſeems to be mere pungency, without any reſemblance to taſte, and it leaves a laſting impreſſion like that made by cauſtic alkali.

"When a rod of zinc, and one of ſilver, are applied to the roof of the mouth, as far back as poſſible, the irritations produced by bringing their outer ends into contact are very ſtrong, and that by the zinc reſembles taſte in the ſame manner as when applied to the tongue."

M. Volta found, that when a tin cup, filled with an alkaline liquor, is held in one or both hands previouſly moiſtened with water, if the point of the tongue is dipped in the liquor, an acid taſte is perceived. This is at firſt diſtinct and pretty ſtrong, but gradually yields to the alkaline taſte of the liquor. The acid taſte is ſtill more remarkable, when, inſtead of an alkaline liquor, an inſipid mucilage is made uſe of. The ſame philoſopher found, that when a cup made of tin, or what is better, of zinc, was filled with water, and placed upon a ſilver ſupport, if the point of the tongue was applied to the water, it was found quite inſipid, till he laid hold of the ſilver ſupport, with the hand well

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(D) This was demonſtrated ſix years ago by Dr Fowler.

(E) Dr Valli made this obſervation ſoon after the diſcovery of galvaniſm.

well moiſtened, when a very diſtinct and very ſtrong acid taſte was immediately perceived.

If one of the metals be applied to the tongue, and the other to the ball of the eye, a pale luminous flaſh is perceived when they are brought into contact with each other, and the ſenſation reſembling taſte is at the ſame time produced in the tongue. A flaſh is, in like manner, produced when one of the metals is applied to the eye, and the other to any part of the palate, fauces, or inſide of the cheek. This experiment requires a good deal of attention in the performance; care muſt be taken not to preſs the piece of metal againſt the ball of the eye, leſt a flaſh ſhould be produced by the mere mechanical preſſure. It ſhould be cautiouſly introduced between the eye-lids, till it juſt touch any part of the ball; and it ſhould be allowed to remain in that ſituation for ſome time before it is brought into contact with the other piece of metal, that the parts may be ſo far accuſtomed to it as to admit of the ſenſations produced being properly attended to. The experiment ſucceeds very well with tin and ſilver; but the flaſh is more bright when zinc and gold are uſed. The piece of metal which is applied to the ball of the eye muſt be finely poliſhed, otherwiſe the mechanical irritation is ſometimes ſo great as to prevent the flaſh from being perceived. Dr Robiſon has obſerved, that the brightneſs of the flaſh correſponds with the extent of contact of the metal with the tongue, palate, fauces, or cheek.

If a piece of one of the metals be placed as high up as poſſible between the gums and the upper lip, and the other in a ſimilar ſituation with reſpect to the under lip, a very vivid flaſh of light is obſerved at the moment that they are brought into contact, and another at the inſtant of their ſeparation. While they remain in contact, no flaſh is obſerved.

When a rod of ſilver is thruſt as far as poſſible up one of the noſtrils, and then brought into contact with a piece of zinc placed upon the tongue, a very ſtrong flaſh of light is produced in the correſponding eye at the inſtant of contact. We have ſometimes imagined, that the flaſh in this experiment was produced before the metals actually touched; but in this we may have been deceived.

The following curious experiment was firſt made by Profeſſor Robiſon: "Put a plate of zinc into one cheek, and a plate of ſilver (a crown piece) into the other, at a little diſtance from each other. Apply the cheeks to them as extenſively as poſſible. Thruſt in a rod of zinc between the zinc and the cheek, and a rod of ſilver between the ſilver and the other cheek. Bring their outer ends ſlowly into contact, and a ſmart convulſive twitch will be felt in the parts of the gums ſituated between them, accompanied by bright flaſhes in the eyes. And theſe will be diſtinctly perceived before contact, and a ſecond time on ſeparating the ends of the rods, or when they have again attained what may be called *the ſtriking diſtance*. If the rods be alternated, no effect whatever is produced."—The flaſhes produced in this laſt experiment are rather more vivid than any which we have been able to excite by the other methods. The convulſive twitches are very diſtinct, and ſomewhat painful, but quite different from the ſenſation produced by an electric ſhock. If the edges of the tongue be allowed to touch the plates of metal in the cheeks, the ſenſation reſembling taſte is felt very ſtrongly; but this does not in the leaſt impair the other effects of the experiment.

No method has yet, we believe, been diſcovered of applying the galvanic influence ſo as to affect the ſenſes of ſmelling or hearing. We have tried many experiments with this view, chiefly on the organs of ſmelling, but hitherto without any ſucceſs (F). Neither has the ſenſe of touch been affected by it, unleſs, indeed, the following experiment be conſidered in that view: Let a ſmall portion of the cuticle be removed from any part of the body by a ſharp knife, and carry the inciſion to ſuch a depth that the blood ſhall juſt begin to ooze from the cutis vera. Let a piece of zinc be applied here, and a piece of ſilver to the tongue; when they are brought into contact, a very ſmart irritation will be felt at the wound.

Some very ſingular facts of this kind have been diſcovered by M. Humboldt, who had the reſolution to make himſelf the ſubject of many well-deviſed experiments. One of the moſt remarkable of theſe is the following: He cauſed two bliſtering plaſters to be applied on the deltoid muſcle of both his own ſhoulders. When the left bliſter was opened, a liquor flowed out, which left no other appearance on the ſkin than a ſlight varniſh, which diſappeared by waſhing. The wound was afterwards left to dry up: this precaution was neceſſary, in order that the acrid humour which the galvanic irritation would produce, might not be attributed to the idioſyncriſis of the veſſels. This painful operation was ſcarcely commenced on the wound, by the application of zinc and ſilver, before the ſerous humour was diſcharged in abundance; its colour became viſibly dark in a few ſeconds, and left on the parts of the ſkin where it paſſed traces of a brown inflamed red. This humour having deſcended towards the pit of the ſtomach, and ſtopped there, cauſed a redneſs of more than an inch in ſurface. The humour, when traced along the epidermis, left ſtains, which, after having been waſhed, appeared of a bluiſh red. The inflamed places, having been imprudently waſhed with cold water, increaſed ſo much in colour and extent, that M. Humboldt, as well as his phyſician, Dr Schalleru, who aſſiſted at theſe experiments, entertained ſome apprehenſion for the conſequences.

Having now taken notice of the principal facts that are hitherto known in galvaniſm, we proceed to conſider ſome of the leading opinions on the ſubject.

19 Phenomena of galvaniſm ſuppoſed to reſult from electricity;

The firſt writers upon the diſcovery of Galvani ſeem almoſt univerſally to have taken it for granted, that the phenomena

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(F) Profeſſor Robiſon has long ago obſerved, that the flavour of a pinch of ſnuff taken from a box made of tin-plate, which has been long in uſe, ſo that the tin coating is removed in many places, is extremely different from that of ſnuff when taken from a new box, or a box lined with tinfoil. The ſame difference is obſerved when we rub a piece of pure tin, or of pure iron and a half worn tinned plate, with the finger. Alſo, if we rub a caſt-ſteel razor, and a common table knife conſiſting of iron and ſteel welded together. This is ſurely owing to a cauſe of the ſame kind.

phenomena depend on the electric fluid; and leaving this very important queſtion behind them, proceeded to explain how this fluid produces ſuch effects. The celebrated diſcoverer of this influence himſelf conſiders a muſcle as the perfect prototype of a Leyden phial. When a muſcle contracts, upon a connection being formed, by means of one or more metals between its external ſurface and the nerve which penetrates it, M. Galvani contends, that, previouſly to this effect, the inner and outer parts of the muſcle contain different quantities of the electric fluid; that the nerve is conſequently in the ſame ſtate, with reſpect to that fluid, as the internal ſubſtance of the muſcle; and that, upon the application of one or more metals between its outer ſurface and the nerve, an electrical diſcharge takes place, which is the cauſe of the contraction of the muſcle. Thus the nerve is ſuppoſed to perform the office of the wire connected with the internal ſurface of the phial; and the excitatory arc is conſidered merely as a conductor.

This theory appears to us juſt as incapable of explaining the phenomena of galvaniſm as it is inconſiſtent with the known laws which regulate the motions of the electric fluid. We ſhall not conſider it minutely; for we hope it will ſoon appear highly probable, if not certain, that the electric fluid has no ſhare in the production of the phenomena in queſtion. If this be the caſe, all the different modifications of that theory muſt of courſe fall to the ground. At preſent we ſhall content ourſelves with aſking the following queſtions:

20 This ſuppoſition ill founded.

1. How is it poſſible for the electric fluid to be condenſed in a muſcle, which is wholly ſurrounded by ſubſtances capable of conducting that fluid?

2. If we ſuppoſe there is ſome non-deſcript non-conducting ſubſtance placed between the external and internal parts of a muſcle, which may admit of the one being poſitively, and the other negatively electrified at the ſame time; how comes it to paſs that a diſcharge does not take place, and a conſequent contraction enſue, when any ſubſtance whatever, capable of conducting the electric fluid, is interpoſed between the nerve and the external ſurface of the muſcle? For example, when the nerve and muſcle are laid bare, and the animal thrown into water; or when the nerve is cut through, and the end applied to the external ſurface of the muſcles.

3. How does it happen, when one diſcharge actually takes place, in conſequence of the application of the excitatory arc, that the balance is not inſtantly reſtored? That this does not happen, appears by the ſame muſcle and nerve being capable of producing many hundreds of ſimilar, and equally ſtrong diſcharges, without any apparent means of the equilibrium being again diſturbed.

We have never ſeen any anſwers to theſe queſtions which appeared to us at all ſatisfactory; and till we have ſeen them anſwered, we muſt be excuſed for diſbelieving M. Galvani's theory.

One of the earlieſt writers, and one of the moſt aſſiduous inveſtigators of the phenomena of galvaniſm, is Dr Valli. He differs in opinion from Galvani upon ſeveral points; but agrees with him in thinking electricity and galvaniſm the ſame. Let us conſider the proofs by which he ſupports this doctrine.

"I have aſſerted (ſays he) that the nervous fluid is the ſame with electricity, and with good reaſon; for

21 Proofs by which Valli endeavours to ſupport it,

"Subſtances which conduct electricity are conductors likewiſe of the nervous fluid.

"Subſtances which are not conductors of electricity do not conduct the nervous fluid.

"Non-conducting bodies, which acquire by heat the property of conducting electricity, preſerve it likewiſe for the nervous fluid.

"Cold, at a certain degree, renders water a non-conductor of electricity, as well as of the nervous fluid.

"The velocity of the nervous fluid is, as far as we can calculate, the ſame with that of electricity.

"The obſtacles which the nerves, under certain circumſtances oppoſe to electricity, they preſent likewiſe to the nervous fluid.

"Attraction is a property of the electric fluid, and this attraction has been diſcovered in the nervous fluid.

"We here ſee the greateſt analogy between theſe fluids; nay, I may even add, the characters of their identity."

That there is a conſiderable analogy between ſome of the effects of the electric fluid and ſome of the phenomena of galvaniſm, we readily admit; but that "the characters of their identity" are any where to be found, we abſolutely deny. In the above paſſage, Dr Valli conſiders it as certain, that the nervous fluid is the cauſe of the phenomena diſcovered by Galvani. But it has never been demonſtrated irrefragably, that any ſuch thing as a nervous fluid exiſts, and ſtill leſs that this is the ſame with the influence diſcovered by Galvani.

22 Inconcluſive and

That bodies are, in general, conductors or non-conductors of galvaniſm, according as they are conductors or non-conductors of electricity, we believe to be true: but this rule is by no means without exception, as it certainly would be, if galvaniſm and electricity were the ſame. There is an experiment of Dr Fowler's, which ſeems to ſhew, that water is a more powerful conductor of galvaniſm than mercury; though the reverſe is generally allowed as to electricity.

If the abdomen of a frog be filled with water, and a ſilver probe paſſed through it ſo as to touch the ſciatic nerves, no contractions are produced; neither do they appear when the probe is touched above the ſurface of the water with a piece of zinc. But if the zinc be applied to the probe at the ſurface of the water, contractions are produced as vigorous as if both the metals touched the nerve. Here the water ſerves as a conducting medium between the nerves and the point where the metals touch each other: but if the abdomen be filled with mercury inſtead of water, no contractions are produced by applying the ſilver probe to the nerves, and touching the probe with the zinc at the ſurface of the mercury. We do not ſee how this experiment can be accounted for, except by allowing that water is a more powerful conductor of galvaniſm than mercury.

If this experiment ſhould be thought inconcluſive, we have the authority of M. Humboldt, and of the committee of the National Inſtitute of France, for ſaying, that there are ſubſtances which, though in an eminent manner conductors of electricity, yet interrupt the motions of galvaniſm. This is certainly ſufficient to take away all weight from Dr Valli's two firſt reaſons for conſidering theſe two fluids as the ſame, viz. that all conductors of electricity are likewiſe conductors of galvaniſm; and that all bodies which do not conduct the former are alſo non conductors of the latter. Theſe two are by far

far the moſt important of his reaſons; and if they were true in their full extent, they would certainly ſhew a very ſtriking analogy, though they would by no means deſerve the appellation of "characters of identity."

As to the Doctor's two next propoſitions, which regard the effects of heat and cold in rendering bodies conductors or non-conductors, they are, in fact, only branches of the two firſt; and as we have ſeen that theſe are not univerſally true, we might admit that they are correct in this particular without weakening our argument. For this reaſon we ſhall not conſider them minutely; but we may obſerve that Dr Fowler's experiments ſhew, that boiling water, and water cooled down to the freezing point, both conduct this influence as well as water at the ordinary temperature of the atmoſphere. If any change in the conducting power takes place beyond theſe points, it may with greater probability be aſcribed to the changes of form which the water undergoes than to the increaſe or diminution of its temperature.

We confeſs ourſelves perfectly ignorant of any data upon which Dr Valli could found a calculation, the reſult of which could ſhew that the velocity of the nervous fluid is the ſame with that of electricity. Suppoſe we ſhould take it into our heads to aſſert that the velocity of galvaniſm is the ſame with that of light, we apprehend our author could not eaſily demonſtrate the contrary. Neither, in all probability, would he conſider this aſſertion of ours as a ſufficient proof that galvaniſm and light are the ſame.

With regard to the next propoſition, that "the obſtacles which the nerves, under certain circumſtances, oppoſe to electricity, they preſent likewiſe to the nervous fluid;" we may remark, that any obſtacle which deſtroys the functions of a nerve completely, will prevent the muſcles which are ſupplied by that nerve from contracting upon the application of any ſtimulus whatever (G). It does not, however, by any means follow, that the paſſage of either the galvanic or the electric fluid is prevented. The nerves may ſtill be very good conductors of both, though the muſcle is deprived of all power of contracting. That there are obſtacles, however, which the nerves, under certain circumſtances, preſent to the paſſage of electricity, but which they do not under the ſame circumſtances preſent to galvaniſm, we think abundantly demonſtrated by Dr Valli's own experiments.

23
Inconſiſtent with his own experiments,

"I have frequently obſerved (ſays he) that the legs, of which the nerves had been tied at a certain diſtance from the muſcles, did not feel the action of a certain quantity of artificial electricity, although they were violently convulſed by exciting that which was inherent and peculiar to them." What then was the cauſe of the difference obſerved in theſe caſes between the effects of galvaniſm and electricity? Was it, that the quantity or degree of the former exceeded that of the latter? Be it ſo.

Dr Valli informs us, that in his experiments, an electric charge which could flaſh through a thickneſs of air equal to .035 of an inch, produced no movement in the leg of a frog of which the crural nerve was tied, while the other leg, of which the nerve was left free, underwent conſiderable movements.

That the influence diſcovered by Galvani can paſs through an exceeding thin plate of air, is certain, as it is tranſmitted from link to link of a chain, where no conſiderable force is uſed to bring the links into contact. Dr Robiſon's experiment, too, in which the flaſhes of light are diſtinctly obſerved before the rods of ſilver and zinc touch each other, is another proof of the ſame fact; and, if we be not deceived, the ſame thing takes place when a rod of ſilver thruſt up the noſtril is applied to a piece of zinc in contact with the tongue. But that it will only paſs through an exceeding thin plate of air, any man may convince himſelf by an experiment, firſt tried by Dr Fowler, which is eaſily repeated. If a ſtick of ſealing-wax be coated with tinfoil, it will be found a very good conductor; but if, with a ſharp pen knife, an almoſt imperceptible diviſion be made acroſs the tinfoil, even this interruption of continuity in the conductor will be found ſufficient effectually to bar the paſſage of galvaniſm.

We find, then, that a quantity of the electric fluid which can paſs through a plate of air of the thickneſs of .035 of an inch, is obſtructed by a ligature upon a nerve, while the galvanic influence paſſes readily along a nerve included in a ligature, but is obſtructed completely by making an almoſt imperceptible diviſion in a good conductor. The plate of air in this caſe ſurely is not near .035 of an inch in thickneſs. It reſults inconteſtibly, from a compariſon of theſe two experiments, that there is, between theſe two agents, ſome other difference beſides the mere degree of intenſity.

We come now to the laſt reaſon which our author aſſigns for his belief that galvaniſm, or, as he chooſes to call it, the *nervous fluid*, is the ſame with electricity. It will be found a very important one. That property by which bodies charged with the electric fluid attract or repel other bodies, according as they are in the ſame or the oppoſite ſtate of electricity from themſelves, is ſo ſtriking, and at the ſame time ſo univerſal, that it has been very properly adopted as the meaſure of this fluid. If it were true, then, that the galvanic influence poſſeſſed the ſame properties of attraction and repulſion as the electric fluid, this circumſtance would certainly increaſe the analogy between them very much. As we have already ſeen, however, that they differ in other eſſential points, even if it were true that they agreed in this, it could conſtitute no proof of their identity. But if, on the other hand, we ſhould find, that this aſſertion of our author is founded on error, and that the galvanic influence poſſeſſes in no degree whatever thoſe properties of attraction and repulſion which have always been juſtly conſidered as eſſential characteriſtics of the electric fluid, we ſhall then be fully juſtified in aſſerting, that theſe two agents, however much they may reſemble each other in ſome leſs important particulars, are in their nature totally diſtinct and unconnected.

Let

(G) We do not here mean that contraction which muſcles are ſuſceptible of long after death, upon having their fibres mechanically irritated, which is produced by what phyſiologiſts have called the *vis inſita*, and which is perfectly known to our cooks, as it was to their predeceſſors in the Roman kitchens, as the foundation of the art of crimping. We at preſent confine ourſelves to contraction produced through the medium of the nerves.

24
And with the knowledge of electricity.

Let us examine the proofs by which Dr Valli's aſſertion is ſupported. He tells us, that he obſerved the hairs of a mouſe, attached to the nerves of frogs, by the tinfoil with which he ſurrounded them, alternately attracted and repelled by each other, whenever another metal was ſo applied as to excite contractions in the frogs. We are very far from meaning to inſinuate that Dr Valli did not ſee, or think he ſaw, what he thus deſcribes; but that the motion of the hairs muſt have ariſen from ſome cauſe, different from that to which he aſcribed it, cannot admit of a doubt; for hairs, in ſuch a ſtate of electricity as he ſuppoſes, never attract, but always repel each other.

Dr Fowler, who has paid particular attention to this part of his ſubject, has many times repeated this experiment, both in the manner deſcribed by Dr Valli and with every variation in the diſpoſition of the hairs which he could deviſe: but whether they were placed on the metals, the nerves, or the muſcles, or upon all at the ſame time, he has never in any inſtance been able to obſerve them agitated in the ſlighteſt degree. He has made ſimilar experiments upon a dog, and upon a large and lively ſkate, by diſpoſing, in the ſame way that Valli did the hairs of a mouſe, flakes of the fineſt flax, ſwan-down, and gold leaf: but although the contractions produced in the ſkate, by the contact of the metals, were ſo ſtrong as to make the animal bound from the table, not the leaſt appearance of electricity was indicated. He next ſuſpended from a ſtick of glaſs, fixed in the cieling of a cloſe room, ſome threads, five feet in length, of the flax uſed in the former experiment; and brought ſome frogs recently killed, and inſulated upon glaſs, as near to them as poſſible without touching: but the threads were in no wiſe affected by the contractions produced in the frogs.

25
Reaſoning of Dr Wells on the ſame ſubject,

In a very ingenious paper upon galvaniſm by Dr Wells, which is publiſhed in the London Philoſophical Tranſactions for 1795, that gentleman maintains the opinion, that the influence diſcovered by Galvani is electrical. He admits, that it is not attended with thoſe appearances of attraction and repulſion which are held to be the teſts of the preſence of electricity; but he contends, that "neither ought ſigns of attraction and repulſion to be in this caſe preſented on the ſuppoſition that the influence is electrical; ſince it is neceſſary, for the exhibition of ſuch appearances, that bodies, after becoming electrical, ſhould remain ſo during ſome ſenſible portion of time; it being well known, for example, that the paſſage of the charge of a Leyden phial, from one of its ſurfaces to the other, does not affect the moſt delicate electrometer, ſuſpended from a wire, or other ſubſtance, which forms the communication between them."

26
Inconcluſive likewiſe.

That the charge of a Leyden phial does not, in paſſing along a wire, affect an electrometer, is certain; and it is equally true, that we have no means of applying an electrometer to a quantity of galvaniſm in a ſtate of reſt in a body. If this influence ever exiſts in ſuch a ſtate, we have no teſt by which we can diſcover its preſence; and it is only from the effects which it produces *in tranſitu* that we know of its exiſtence. But the electric fluid, in paſſing from link to link of a chain, ſenſibly affects an electrometer; and in Dr Fowler's experiment with the ſkate, for example, as more than one piece of metal is employed as an exciter, the fluid, in paſſing from one piece to another, ſhould have affected the light ſubſtances which were placed upon them. This appears to us a ſufficient anſwer to the objection ſtarted by Dr Wells: but the ſame objection having been lately made to us by a gentleman from whom we ſhall always receive every ſuggeſtion with uncommon deference, we thought it worth while to try the following experiment:

Three hours after a frog had been decapitated, it ſhewed ſtrong ſigns of galvanic ſuſceptibility. One of the ſciatic nerves being coated with tinfoil in the uſual manner, the leg was laid upon a plate of zinc. A gentleman was deſired to lay hold of the nerve and its coating with the fingers of one hand, which had been previouſly dipped in water, while with the other hand, alſo wet, he held the end of a ſmall braſs chain about two inches in length. Another gentleman now took hold of the other end of the chain, and with a ſilver probe, held in his other hand, touched the plate of zinc. The influence being thus made to paſs through the chain, the leg contracted vigorouſly; but a very ſenſible electrometer, held ſo near to the chain as almoſt to touch it, was neither attracted nor repelled. In performing this experiment, it was neceſſary to have the hands wet, as the dry cuticle tends much to obſtruct the paſſage of galvaniſm; but the utmoſt care was taken that the chain ſhould be perfectly dry, otherwiſe the influence might have been tranſmitted by the moiſture upon its ſurface without paſſing through the chain itſelf.

To avoid the poſſibility of this happening, the experiment was varied in the following manner: The frog's leg was laid upon a plate of zinc, and the nerve upon a plate of ſilver. A gentleman now took a ſilver probe, and one end of the braſs chain in contact with it, in one hand; and in the other hand he held the other end of the chain in contact with a rod of zinc. He now touched the ſilver plate with the rod of ſilver, and the zinc plate with the rod of zinc. As the influence was not now to be made to paſs through his body, there was no neceſſity for his hands being wet; the whole excitatory arc was therefore made completely dry. In this way very ſtrong contractions were excited in the leg, and ſtill the electrometer was not affected in the ſmalleſt degree when brought near the chain.

It is proper to obſerve, that Dr Valli, in his aſſertion that attraction is a property of galvaniſm, does not reſt entirely upon his own obſervation; a committee of the Academy of Sciences at Paris performed the following experiment along with him: "They placed a prepared frog in a veſſel which contained the electrometer of M. Coulomb, charged negatively and poſitively by turns. In both caſes, in exciting the animal in the common way, the ball of the electrometer was attracted." It appears to us that Dr Valli and the committee have been deceived, by the friction produced by the motion of the animals under their experiments having excited ſo much electricity as to affect the electrometer. The firſt time we tried the experiment abovementioned with the braſs chain, we were almoſt miſled by a ſimilar circumſtance. Inſtead of an artificial electrometer, which we happened not to have at hand, we made uſe of a very long and ſlender human hair; and we found that it was ſtrongly attracted by the chain. Upon an attentive examination, however, we found that this did not ariſe from the action of the influence paſſing through the chain, but from the ſtate of the hair itſelf, which was ſo highly electrical as to be ſtrongly attracted by every conducting ſubſtance which it approached. Upon ſubſtituting another hair, which ſhewed no mark of being either poſitively or negatively electrified, it was neither attracted nor repelled by the chain. From the above, or ſome ſimilar circumſtance, it is probable that Dr Valli's miſtake has originated; but we are confident, that whoever will repeat the experiment with ſufficient attention, will find the reſult preciſely as we have deſcribed it.

Perhaps it may ſtill be ſaid, that although we have never been able to diſcover attraction and repulſion as properties of galvaniſm, this may ariſe from our not being able to accumulate this influence in ſufficient quantity. To this reaſoning, if reaſoning it can be called, we oppoſe the following conſiderations, which ſtate a diſſimilarity in the phenomena of electricity and galvaniſm, that ſeems abſolutely irreconcilable with the identity of the cauſe.

27
Demonſtration, that the phenomena of galvaniſm and of electricity reſult not from the ſame cauſe.

Nothing is more completely eſtabliſhed in the ſcience of electricity than this, that all thoſe appearances which we call *attractions*, *repulſions*, *abſtractions*, and *accumulation of electric fluid*, are preciſely ſimilar to what would be the appearances, if electricity were a fluid, whoſe particles repel each other, and attract the particles of other matter, according to a certain law (See ELECTRICITY, *Suppl.*). Of all thoſe phenomena, the moſt remarkable is the accumulation of electric energy (to give it no more definite name), by means of thin idioelectrics, coated with non-electrics; ſuch, namely, as are exhibited by the Leyden phial, the condenſer, the doubler, &c.

If the phenomena of galvaniſm are produced by the paſſage of electric fluid from one extremity of the excitatory arc to the other, this paſſage will be regulated by the known laws of electricity. It may therefore be accumulated (*in tranſitu*) by means of an apparatus ſimilar to the coated pane, or to the condenſer. Profeſſor Robiſon, with this view, made the following experiments:

1. He made a part of the conductor ~~to~~ his condenſer, or collector of atmoſpheric electricity, conſiſt of a long glaſs rod, on one ſide of which was faſtened (with varniſh) a very narrow ſlip of tinfoil; there was a fine point at one end of this rod, and a gold leaf electrometer at the other. This apparatus was inſulated at one end of a room 19 feet long, having a window in the middle of each ſide. A ſmall electric machine was placed at the other end. On a dry day, with a gentle breeze in a direction acroſs the room, both windows were opened a little way, ſo that there was a continual ſtream of air acroſs the room. The machine was worked; and after a ſhort time had elapſed, the electrometer began to diverge, gradually opened, and at laſt ſtruck the conducting ſlips on each ſide, and then collapſed, and again began to diverge. The windows were ſhut; and immediately, without working the machine, the electrometer diverged rapidly, and touched the ſides of the phial every minute and half. This continued ſo long, that there ſeemed to be no end to it. The Profeſſor now made a cut acroſs the tinfoil with a very ſharp knife; the electrometer now diverged very feebly, and 7½ minutes elapſed before it touched the ſides. He paſſed the knife a ſecond time through the cut. This widened it (though ſcarcely ſenſible to the eye), becauſe the knife had been blunted by the glaſs in the firſt operation. All divergency of the electrometer was now at an end; and although the machine was worked till the electric ſmell was ſenſible at the door to a perſon who happened to come in at this time, no tendency to divergence was obſerved. (*N. B.* the top of the electrometer had no conducting ſubſtance about it, except the ſlip of tinfoil).

The cut, being examined with a microſcope furniſhed with a micrometer, was $\frac{31}{1000}$th of an inch. It was now filled up, by binding over it another ſlip of tinfoil. A plate of talc, whoſe thickneſs did not exceed the 900th of an inch, was coated on one ſide in a circle of 1½ inch diameter. The electrometer was removed, and the coated ſide of the talc was put into cloſe contact with the ſlip of tinfoil on the glaſs rod. A ſtand of tin, whoſe top was a plate of 1½ inch diameter, ſmeared over with mercury, was placed in contact with the other ſide of the talc, and they were preſſed into very cloſe and continuous contact.

The machine being now worked, the coated talc received a charge in about 5 minutes ſufficient to give a very ſmart ſhock: and this was repeated with great regularity every five or ſix minutes. The windows were now thrown open, and the room cleared of its former contents of air, till none of thoſe preſent could perceive any electric ſmell. The machine was now worked again. But after half an hour, only a very faint twitch was felt; but enough to ſhew that an accumulation was taking place. The windows were now half ſhut. After working the machine about five minutes, a faint twitch was obtained; after a quarter of an hour more, there was a moderate ſhock.

In this ſtate of things, the apparatus was examined as a condenſer, by firſt taking out the ſharp point by an inſulating handle, and then removing the tin ſtand. Examined in this way, it appeared plainly that, even when all the windows were open, the accumulation began almoſt as ſoon as the machine was worked. Nay, it was found, on another day equally favourable, that a plate of talc $\frac{47}{1000}$ or $\frac{50}{1000}$ of an inch thick, took a charge, although a cut of $\frac{31}{1000}$ wide did not allow the electricity to fly acroſs it. This is perfectly ſimilar to all our experiments on coated glaſs. The thickneſs which admits an accumulation is almoſt incomparably greater than the diſtance to which a ſpark will fly, or a concuſſion is producible, in the ſame intenſity of electricity.

2. The above deſcribed apparatus was inſulated, and a wire connected with each end. To one wire was joined a thin plate of lac, coated on the ſide next the wire; and to the other a piece of moiſt leather covered with tin-foil. Theſe plates were rubbed together by means of inſulating handles. The plate of coated talc quickly took a charge.

The ſame plate of talc, and afterwards another plate not more than half as thick, was now made part of the excitatory arc, and ſometimes part of the animal arc. Sometimes plates of varniſh, incomparably thinner than either of theſe, were employed. But all Profeſſor Robiſon's attempts to produce an accumulation of galvanic energy in this way were fruitleſs. The ſecond form of the electrical experiment was adopted, as having a ſomewhat greater reſemblance to the ſuppoſed procedure of galvaniſm; but the well-informed electrician will eaſily perceive, that the firſt form is far more delicate and deciſive.

The internal procedure in the electric and galvanic convulſions is therefore ſo different, nay, oppoſite, that we cannot bring ourſelves to think that the appearances are operations of the ſame agent (H).

We have now gone over all the points of reſemblance which, in Dr Valli's opinion, conſtitute the characters of the identity of galvaniſm and electricity. We think that, without going farther, we might ſafely reſt our aſſertion, that theſe two agents are perfectly diſtinct and unconnected with each other. But there are ſeveral other circumſtances which merit attention.

28 Farther conſiderations on electricity and galvaniſm. No electrical phenomenon can take place between two bodies, unleſs theſe bodies be in oppoſite ſtates of electricity with regard to each other. Now, how are we to account for the accumulation of electricity in any body, or part of a body, ſurrounded on all hands by conducting ſubſtances? The experiments of Galvani ſucceed equally well, whether the ſubjects of them be inſulated or ſurrounded by conductors; whether performed in the drieſt air or under water (I); whether, by means of an electrical machine, we charge the animal and the metals till every part of them ſtrongly affect the electrometer, or whether we reverſe the experiment and electrify them negatively, ſtill no change is produced in the force or frequency of the actions excited by the application of the metals. Is there any electrical experiment which could continue to give the ſame reſult in ſuch oppoſite circumſtances? or is there any poſſibility of accounting for it conſiſtently with the known laws of the electric fluid?

The writers on this ſubject who adopt the electric theory, inſtead of attempting to explain how the electric fluid can be condenſed in a body ſurrounded by conducting ſubſtances, have recourſe to the analogy of the gymnotus, torpedo, and other fiſhes of the ſame kind. Here, ſay they, we have in fact the electric fluid accumulated in ſuch a ſituation, and there is no reaſoning againſt facts. We anſwer, that theſe animals are all furniſhed with organs of a very peculiar ſtructure, which may poſſibly be fitted for the purpoſe of ſuch a condenſation. Beſides, we apprehend it has never been inconteſtibly proved that theſe ſingular animals derive their powers from the electric fluid. Without wiſhing to enter into this queſtion, which is foreign to our preſent ſubject, we may remark, that Mr Walſh diſcovered, that the ſhock of the torpedo would not paſs through a ſmall braſs chain; a circumſtance in which it differs remarkably both from electricity and from the influence diſcovered by Galvani.

It were worth while to try Profeſſor Robiſon's methods of accumulation in the examination of the convulſions occaſioned by the torpedo. The Profeſſor ſuſpects that the popular horror at the lamprey, and the accounts of cramps and pains produced by it, have their ſource in ſome ſimilar powers of that animal.

Dr Valli's reaſoning on this part of the ſubject is very curious. He takes it for granted that the gymnotus owes its influence to the electric fluid. Then, though the gymnotus gives ſhocks and emits ſparks, while the torpedo only gives ſhocks without emitting ſparks, he ſays it would be abſurd to aſſert that the torpedo derives its influence from a cauſe different from the gymnotus. Again, though the influence diſcovered by Galvani neither gives ſhocks nor emits ſparks, it would ſtill be abſurd to maintain that it is not the ſame as the electric fluid, and as the influence of the gymnotus and torpedo. To diſſent from any part of this very logical deduction, he declares would be contrary to the laws of philoſophiſing! *Riſum teneatis?*

Afraid, probably, that his readers might be tempted to offend againſt theſe new laws, he proceeds to ſtrengthen them by the analogy of animals and vegetables retaining an uniform temperature *in media*, warmer or colder than their own bodies; from which he argues that they may alſo have a power of accumulating electricity, and retaining it in a particular part, though their whole bodies are conductors. But the caſes are in no reſpect ſimilar. Neither animals nor vegetables accumulate caloric in any particular part of their bodies in preference to any other part. They have no power of *retaining* caloric in their bodies more ſtrongly than any other bodies do; for if they are placed in a medium colder than themſelves, they are continually imparting caloric to that medium. Neither is there the ſmalleſt proof, from any experiments yet publiſhed, that when placed in a medium warmer than themſelves, they do not continually abſorb caloric from it. The exiſtence of a frigorific power in animals appears to us exceedingly problematical; but if it were proved to exiſt, it would by no means demonſtrate that animals or vegetables have a faculty of declining to abſorb caloric from bodies warmer than themſelves. It is readily admitted, that animals and vegetables have a power, within certain limits, of preſerving their temperature higher than that of the ſurrounding medium; nor is there any thing ſurpriſing in this, as the caloric, which they are continually receiving by the decompoſition of oxygenous gas, is diſſipated ſlowly. But if we ſhould allow that animals have a ſimilar faculty of generating the electric fluid; from the nature of that fluid it muſt be continually communicated, not only to every part of the bodies of the animals themſelves, the whole of which are conductors, but to every conducting ſubſtance contiguous to them: and this muſt take place, not ſlowly, like the diſſipation of caloric, but inſtantaneouſly, ſo as to render any ſenſible accumulation impoſſible.

Galvaniſm differs from electricity in nothing more remarkably than in the mode of its excitement and diſcharge. 29 Difference in their mode of excitement,

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(H) What if it were called *metallorgaſm*, which tranſlates exactly metallic irritation, or metallegerſiſm, from μεταλλον, and εγερσις *excitatio.*

(I) Dr Fowler mentions an exception to this. "When the ſeparated leg of a frog was held under water, and formed part of the circuit through which this influence had to paſs in order to excite another leg, it never contracted; although it did, and ſtrongly, when held above the ſurface." In this caſe it is plain, that the frog's leg had in fact formed no part of the circuit through which the influence paſſed; the influence had been tranſmitted by the water in which the leg was held.

charge. To produce the phenomena diſcovered by Galvani, no operation at all ſimilar to the friction of an electric upon a conducting ſubſtance is neceſſary (I). The nerves and muſcles have only to be laid bare, and a communication formed between them by means of the excitatory arc, when the contractions immediately enſue. In the caſe of electricity, a ſingle diſcharge having reſtored the equilibrium, no farther effects can be produced till this has been again deſtroyed by ſome means capable of producing a condenſation in one quarter, and a comparative rarefaction in another. The fact is very different with regard to galvaniſm; for with it the number of ſhocks which may be given appears to be infinite. Nay, they frequently become ſtronger in proportion as they have been longer continued: this influence differing extremely in this particular, too, from the electric fluid, which, beſides being itſelf exhauſted, never fails in a remarkable manner to exhauſt the contractile power of the muſcles.

30
And in the duration of their effects.

The permanence of the effects of galvaniſm is ſtill more ſtriking in the experiments upon the organ of taſte. When the metals are applied to the tongue, the ſenſation produced is not ſudden and tranſient; but ſo long as the metals are in contact with the tongue and with each other, ſo long does the taſte continue; and, after ſome time, it becomes inſufferably diſagreeable. M. Volta, who adopts the electric theory with various modifications, ſenſible of the permanence of the effect, in his curious experiments abovementioned ſuppoſes, that a ſtream of electricity paſſes from the tin cup to the liquor, from this to the tongue of the perſon making the experiment, then through his body, and returns through the water upon his hands to the cup; and thus he ſuppoſes the fluid to move perpetually in a circle. It is ſurely unneceſſary for us to obſerve, that the ſuppoſition of a ſtream of electricity, continually moving in a circle in this manner, is wholly inconſiſtent with the laws which appear in every caſe to regulate the motions of that fluid. The ſame obſervation applies to the manner in which he explains moſt of the other phenomena of galvaniſm.

The electric fluid cannot be put in motion but by deſtroying the equilibrium to which it perpetually tends; but whenever this is deſtroyed, all that is required to produce a diſcharge is, that a ſingle conducting ſubſtance be placed between the two points in which it is unequally diſtributed. Here again there is a very wide diſtinction between this fluid and the influence diſcovered by Galvani. M. Volta divides all conductors of galvaniſm into two claſſes; 1ſt, Dry conductors, comprehending metals, pyrites, ſome other minerals, and charcoal; and, 2d, Moiſt conductors. He aſſerts, that it is abſolutely neceſſary, in order to the production of the phenomena, that two conductors of the firſt claſs touch each other immediately on one hand, while at their other extremities they touch conductors of the ſecond claſs. Whether this be admitted or not, we have already ſtated our opinion that the action of two different ſubſtances is abſolutely neceſſary in order to excite contractions: and although it is contended by ſome writers that a ſingle piece of metal has ſometimes been found ſufficient, yet even they muſt allow that, in by far the greater number of caſes, it has been found neceſſary to make uſe of two metals, and that the effect is even heightened in general by employing three. In the whole ſcience of electricity, we do not know a ſingle fact which bears the ſlighteſt analogy to this. Never in a ſingle inſtance has it been found, that the effects of a Leyden phial have been increaſed by uſing a conductor formed of two or more metals in procuring the diſcharge.

31
Some men non-conductors of galvaniſm.

Before leaving the ſubject of conductors, we may take notice of a very curious and important fact mentioned by Dr Valli. "Amongſt men," ſays he, "there are ſome individuals who are good conductors, others who are leſs ſo; and ſome again who appear to be almoſt non-conductors. I was one day carrying on, with three of my friends, ſome experiments upon frogs. A frog was put in water, and we each by turn eſſayed its power. Two of us excited ſtrong convulſions, the third only feeble ones, and the fourth none at all. This experiment was repeated frequently with the ſame reſult. This is not the only example I could adduce of the reality of this fact, but I do not think it neceſſary to dwell any longer upon it." We have met with one individual who is not ſenſible of any peculiar ſenſation when the metals are applied to his tongue. This ſeems in ſome meaſure to corroborate Dr Valli's obſervation. It is apprehended, however, that all men are equally good conductors of electricity.

There is ſtill another very marked diſtinction between the effects of galvaniſm and electricity. No ſhock at all reſembling that produced by the electric fluid has ever been felt by any perſon whoſe body was made a part of the chain conducting the galvanic influence, while a very ſmall quantity of the electric fluid is immediately felt (K). In Dr Robiſon's experiment with the plates of zinc and ſilver in the cheeks, there is no doubt a convulſive twitch diſtinctly felt in the gums; but, as we have already obſerved, the ſenſation thus produced

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(I) It is true, as we have noticed above, that galvanic energy is ſometimes communicated to a conducting ſubſtance by rubbing it upon ſome other ſubſtance; but this has no reſemblance to the excitement of electricity by friction. The galvanic energy is communicated in this caſe to a *conducting* ſubſtance, and it ſucceeds as readily when both the bodies are of this claſs as when one of them is an idio-electric. But no electric phenomenon has ever been produced by the friction of two conducting bodies upon each other; one of them muſt be an idio-electric, and it is in this one that the excitement takes place.

(K) There is an exception to this rule which ought to be taken notice of. M. Cotugno informs us, that when he was one day employed in diſſecting a live mouſe, he received a ſenſible ſhock from the animal. But as neither he nor any other perſon has ever been ſimilarly affected in any other inſtance, it ſeems pretty certain that he was deceived into the belief of a ſhock from the ſenſation produced by the ſtruggles of the animal he diſſected.

produced is quite different from that which is felt from an electric ſhock (L).

There is an experiment related by Dr Valli, which ſeems to ſhew that nothing like an electric ſhock is felt, even when this influence is tranſmitted through a nerve ſo as to excite convulſions. Having laid bare the nerves of a fowl's wing, without cutting them, and without killing the fowl, upon applying the metals very ſmart movements were produced, but the animal remained perfectly tranquil. Nor was this owing to the fowl being in a ſtate of inſenſibility; for when the nerves were pricked or irritated it ſcreamed violently. But all animals ſhew ſigns of great uneaſineſs from an electric ſhock.

In general, it muſt be confeſſed, that animals under experiments of this kind ſeem reſtleſs and uneaſy. The great diſtinction of which we ſpeak at preſent, conſiſts in this, that the electric fluid produces a ſhock and uneaſy ſenſation when any part of the body is introduced into the conducting chain; while the influence diſcovered by Galvani, on the contrary, when merely tranſmitted through the body in this manner, gives no ſhock, nor any ſenſation whatever, inſomuch that we are not ſenſible of its paſſage. If this influence be made to act directly on a nerve, there is, no doubt, ſome kind of irritation produced, as appears from the effect of the metals upon the tongue, the eye, and other nervous parts: but ſtill this action bears no analogy to that of the electric fluid; as the application of the metals to the organs of ſenſe, produces in each organ the peculiar ſenſation for which it is conſtructed, as taſte in the tongue, light in the eye, &c. ſo when nerves intended merely for muſcular motion are ſubjected to the action of galvaniſm, the effect produced is motion in the muſcles on which they are diſtributed.

If this view of the matter be juſt, it will explain why no ſhock is felt when the human body is made a part of the conducting chain. In that caſe the influence does not, in all probability, act directly upon any nerve; and we ſee that this influence poſſeſſes no power, like the electric fluid, of producing a convulſive ſhock, when merely paſſed through any part of the body; but it has this peculiar property, when paſſed directly through a nerve, it excites that nerve to perform the function for which it was intended by nature. To this it will no doubt be objected, that contractions may be excited in different parts of a frog without any diviſion being made in its ſkin; and here it may be ſuppoſed that the influence is not made to paſs directly through a nerve. But it ought to be recollected that the ſkin of theſe animals is abundantly ſupplied with nerves, whoſe trunks communicate at different places with thoſe which ſupply the muſcles; and that the contractions are always ſtrong and eaſily excited, in proportion as they are applied near to the courſe of any of the nerves which go to the muſcles. But though we had no doubt that the influence might be tranſmitted through the bodies of theſe animals, as well as through the human body, without any contractions being produced, we have thought it worth while to aſcertain the fact by the following experiment.

A frog was prepared in the uſual manner by coating its ſciatic nerve with tinfoil, and laying the leg upon a plate of zinc. Another frog, in a very vigorous ſtate had its fore legs and cheſt attached to a rod of ſilver, and its poſterior extremities to a rod of zinc. The ſilver rod was applied to the tinfoil and nerve of the prepared frog, and the zinc rod to the plate of zinc upon which the leg was laid. Immediately very ſtrong contractions took place in the leg; but no motion, nor the ſlighteſt mark of uneaſineſs, appeared in the other frog, through the body of which the influence muſt have paſſed. It is neceſſary in this experiment to dry the body of the frog which is to ſerve as a conductor very carefully, otherwiſe the influence might be tranſmitted by the water upon its ſurface without paſſing through its body.

There is an experiment mentioned by Dr Fowler, which ſhews a ſtriking difference between electricity and galvaniſm. It was inſtituted with a view to aſcertain the effects of the latter upon the blood-veſſels. The Doctor relates it as follows: "Having laid bare, and ſeparated from ſurrounding parts and from each other, the crural artery and nerve in the thigh of a full grown frog, I cut out the whole of the nerve between the pelvis and the knee: I then inſinuated beneath the artery a thin plate of ſealing-wax, ſpread upon paper, and broad enough to keep a large portion of the artery completely apart from the reſt of the thigh. The blood ſtill continued to flow through the whole courſe of the artery in an undiminiſhed ſtream. The artery, thus partially inſulated, was touched with ſilver and zinc, which were then brought into contact with each other; but no contraction whatever was produced in any muſcle of the limb. This experiment was frequently repeated upon ſeveral different frogs, both in whom the nerve was, and in whom it was not divided. The reſult was uniformly the ſame. But vivid contractions were produced in the whole limb when an electric

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(L) "No one (ſays M. Humboldt) can ſpeak more decidedly on this ſubject than myſelf, having made ſeveral experiments on my own perſon, the ſeat of which, in ſome inſtances, was the ſocket of a tooth which I had cauſed to be extracted; in others, certain wounds which I made in my hand; and in others, the excoriations produced by four bliſtering plaſters." The following is the reſult of theſe painful experiments. The galvanic irritation is always painful, and the more ſo in proportion as the irritated part is more injured, and the time of irritation more prolonged. The firſt ſtrokes are felt but ſlightly; the five or ſix following are much more ſenſible, and even ſcarcely to be endured, until the irritated nerve becomes inſenſible from continued ſtimulus. The ſenſation does not at all reſemble that which is cauſed by the electric commotion, and the electric bath; it is a peculiar kind of pain which is neither ſharp, pungent, penetrating, nor by intermiſſions, like that which is cauſed by the electric fluid. We may diſtinguiſh a violent ſtroke, a regular preſſure, accompanied by an unintermitting glow, which is incomparably more active when the wound is covered with a plate of ſilver and irritated by a rod of zinc, than when the plate of zinc is placed on the wound, and the ſilver pincers are uſed to eſtabliſh the communication.

lectric ſpark, or even a full ſtream of the aura was paſſed into the artery."

Before taking leave of this branch of our ſubject, it may be proper to take notice of one fact, which may be thought to militate againſt the doctrine we have endeavoured to eſtabliſh. It is ſaid that a frog, exhauſted and brought near to a charged electrophorus, has been found to reſume its ſuſceptibility. We think this fact may be accounted for without admitting any connection between galvaniſm and electricity, merely by ſuppoſing that the irritability of the muſcles, which had been exhauſted, was reſtored by the application of a moderate ſtimulus, (the electric fluid), of a kind different from thoſe by which it had been exhauſted. Such of our readers as are acquainted with the writings of modern phyſiologiſts on the ſubject of muſcular irritability, will know that facts of this kind are very common. Thus it has been found by M. Humboldt, that the oxygenated muriatic acid has often reſtored irritability. To this explanation it will no doubt be objected, that the application of other ſtimuli, as alcohol and a ſolution of potaſh, inſtead of reſtoring, totally deſtroy the ſuſceptibility of galvaniſm. Suſpecting, that although theſe ſubſtances in a concentrated ſtate deſtroy the ſuſceptibility, yet that when ſufficiently diluted, they might be found to have the oppoſite effect, we tried the following experiment, which confirmed our conjecture.

A frog, 57 hours after it had been decapitated, had ceaſed for above an hour to be capable of excitement by the application of the metals in any way that could be deviſed. A few drops of alcohol being diluted with about a tea-ſpoonful of water, the nerve and the muſcles which had been laid bare, as well as the whole ſkin of the animal, were wet with it. Upon the application of an excitatory arc, compoſed of four pieces, gold, zinc, ſilver, and tinfoil, a few very ſlight contractions of the toes were diſtinctly obſerved. After this, no means that we could think of produced the ſmalleſt excitement. Alcohol was now applied in a more concentrated ſtate, but without any effect. The ſame four pieces of metal which produced the contractions of the toes, had been uſed before the diluted alcohol was applied, but without effect. We have not tried the application of potaſh much diluted.

From what has been ſaid, we think we are fully warranted in ſaying, that although ſome of the phænomena diſcovered by Galvani bear a ſtriking reſemblance to ſome of thoſe produced by the electric fluid; yet there are others, and theſe not the leaſt important, which differ ſo widely from any effects which have ever been ſeen to ariſe from that fluid, that they muſt derive their origin from ſome other cauſe. Our readers may probably think that we have dedicated too much time to this queſtion; but as we conceive it to be the moſt important point which can be diſcuſſed on this ſubject, we thought it worth while to conſider it at ſome length; and we were the more convinced of the neceſſity of doing ſo, from this conſideration, that there are ſtill ſome writers of high authority who maintain the hypotheſis, that galvaniſm and electricity are the ſame.

32
The galvanic influence probably foreign from animals.

The next queſtion that occurs to us with regard to the nature of galvaniſm is, whether or not it depends upon any law of animal life? To us it appears rather more probable, that the influence which incites the muſcles of animals to contract in the experiments of Galvani, is ſomething quite foreign to the animals themſelves; as much ſo as the electric fluid of the Leyden phial is to the animal which receives a ſhock from it, in both caſes the body of the animal acting as a mere conductor. Upon this queſtion, however, we confeſs that we have neither facts nor arguments to adduce ſufficient to warrant our drawing any certain concluſion. It will doubtleſs be aſked, if this influence be ſomething foreign to the bodies of animals, why do we never find it acting anywhere but in their bodies? why is it not, like the electric fluid, capable of being made evident to the ſenſes by its effects upon inanimate matter? The only anſwer which we are in a condition to give to this queſtion is, that it may very poſſibly be capable of producing important effects upon inanimate matter, nay, theſe effects may be the ſubject of our daily obſervation; but for want of our being ſufficiently acquainted with galvaniſm to point out the relation between theſe effects and their cauſe, the effects themſelves are either not explained at all, or aſcribed perhaps to ſome other power, with which they have no connection. In like manner, the electric fluid has doubtleſs been producing moſt important effects from the beginning of time; but, prior to the diſcovery of that fluid, theſe were either not explained at all, or conſidered as originating from ſome cauſe which, in fact, had no ſhare in their production.

The great difficulty is to obtain ſome teſt by which we may detect the galvanic influence when actually preſent in inanimate matter. Hitherto we have no ſuch teſt; nor ſhould we know that ſuch an influence exiſts, but for the effects which it produces upon the bodies of animals through the medium of their nerves. If we had any means of aſcertaining its exiſtence, either in a ſeparate ſtate, or conjoined with inanimate matter, the ſcience would make a rapid progreſs, as it would be eaſy to diverſify experiments ſo as to diſcover its nature and effects. To detect it in a ſeparate ſtate is, in all probability, impoſſible; but that the zeal and ingenuity of philoſophers will one day be able to diſcover ſome teſt of its preſence in inanimate matter, there ſeems no reaſon to doubt.

We have made many experiments with a view to diſcover ſuch a teſt, but hitherto without the ſmalleſt ſucceſs. In the trials we have already made, our views have been chiefly confined to the diſcovery of ſome chemical effects of this influence upon inanimate matter. M. Volta and other writers, having conſidered the ſenſation produced by it upon the tongue as ſimilar to that occaſioned by acids, we were not without hopes that it would be found to reſemble that claſs of ſubſtances in ſome of its other properties. We have therefore tranſmitted it through liquids tinged with the moſt delicate vegetable colours; but no change in theſe colours has been effected by the tranſmiſſion of many galvanic ſhocks. We have alſo tried, in the ſame way, alkaline liquors, without any effect. We next diſſolved in water different neutral ſalts, and other compound bodies, of which the parts are held together by the weakeſt affinities; but no change has been obſerved to be produced in them by the tranſmiſſion of this influence. Our want of ſucceſs, however, ſhall not deter us from continuing our efforts; we ſhall vary the nature of our experiments in every way that ſhall occur to us as likely to be attended with advantage; and if we ſhould ultimately fail, we truſt that others will be more fortunate. Every new fact which is diſcovered upon the ſubject tends to facilitate this inveſtigation, by furniſhing us with new guides to direct the courſe of our experiments.

33
Dr Fowler heſitates on this point,

Dr Fowler is of opinion, that this influence, whatever it may be, is not derived from the metals alone, but that the animals at leaſt contribute to its production, as well as indicate its preſence; and he ſeems to have been led to adopt this theory chiefly from two conſiderations, neither of which appears to us to have much weight. They are the following: The neceſſity of a communication between the metals and the muſcles, as well as between the metals and the nerves; and the obſervation, that animals have a more complete controul over its effects than one would expect them to have over an influence wholly external to them. But the communication between the metals and the muſcles may be neceſſary to the contraction of the latter, tho' not to the production of galvaniſm; which, however, for want of any obvious effect, is not obſerved. That animals have ſome controul over the effects of galvaniſm upon themſelves, may be very true; but this circumſtance does not appear to us capable of proving any thing, as they have a controul over the effects of other ſtimuli in the ſame way. Thus, an animal of any reſolution can bear, without betraying any uneaſy ſenſation, a blow which, inflicted unexpectedly, would have produced a convulſive ſtart. The will does not in any degree controul the effects produced by galvaniſm upon our ſenſes of taſte, ſeeing, &c.; that is, the ſenſations are produced, though we may have reſolution not to betray them. But, ſays Dr Fowler, the will is not able to controul the effects of electricity, when the electricity is otherwiſe ſufficiently ſtrong to excite muſcles to contraction. This argument may tend to ſhew, that galvaniſm differs from electricity; but as it muſt be admitted, that we can reſiſt the contractions naturally produced by the application of other foreign ſtimuli, it by no means proves that animals have any power of preventing the excitement or tranſmiſſion of galvaniſm. Beſides, though we cannot prevent an involuntary contraction of our muſcles from taking place when an electric ſhock of conſiderable ſtrength is paſſed through them, yet any man may with his hand draw ſparks from the prime conductor of an electric machine without ſhrinking, though even theſe ſparks would, if he were off his guard, produce a convulſive ſtart.

34
We think without reaſon.

If the galvanic influence exiſted ready formed in the muſcles or nerves of animals, the only thing requiſite to the production of the contractions would be to make a communication between the nerves and muſcles, by means of any ſingle ſubſtance capable of conducting this influence; as water, for example: but the reverſe is known to be true. It may be ſaid, however, that, although there is no proof that any influence naturally reſides in the nerves or muſcles capable of producing the effects mentioned by M. Galvani, theſe ſubſtances may ſtill by ſome power independent of the properties they poſſeſs in common with dead matter *contribute* to the excitement of the influence, which is ſo well known to exiſt in them after a certain application of metals. Upon this part of the ſubject, the obſervations of Dr Wells will be found to merit conſiderable attention.

"It is known (ſays that gentleman), that if a muſcle and its nerve be covered with two pieces of the ſame metal, no motion will take place upon connecting thoſe pieces by means of one or more different metals. After making this experiment one day, I accidentally applied the metal I had uſed as the connector, and which I ſtill held in one hand, to the coating of the muſcle only, while with the other hand I touched the ſimilar coating of the nerve, and was ſurpriſed to find that the muſcle was immediately thrown into contraction. Having produced motions in this way ſufficiently often to place the fact beyond doubt, I next began to conſider its relations to other facts formerly known. I very ſoon perceived, that the immediate exciting cauſe of theſe motions could not be derived from the action of the metals upon the muſcle and nerve to which they were applied; otherwiſe it muſt have been admitted, that my body, and a metal formed together a better conductor of the exciting influence than a metal alone; the contrary of which I had known, from many experiments, to be the caſe. The only ſource, therefore, to which it could poſſibly be referred, was the action of the metals upon my own body. It then occurred to me, that a proper opportunity now offered itſelf of determining whether animals contribute to the production of this influence by means of any other property than their moiſture. With this view, I employed various moiſt ſubſtances, in which there could be no ſuſpicion of life to conſtitute, with one or more metals, different from that of the coatings of the muſcle and nerve, a connecting medium between theſe coatings, and found that they produced the ſame effect as my body. A ſingle drop of water was even ſufficient for this purpoſe; though, in general, the greater the quantity of the moiſture which was uſed, the more readily and powerfully were contractions of the muſcle excited. But if the mutual operation of metals and moiſture be fully adequate to the excitement of an influence capable of occaſioning muſcles to contract, it follows, as an immediate conſequence, that animals act by their moiſture alone in giving origin to the ſame influence in M. Galvani's experiments, unleſs we are to admit more cauſes of an effect than what are ſufficient for its production." We do not quote the above reaſoning as perfectly concluſive, for it by no means appears to us to be ſo; but it certainly gives ſome probability to the opinion, that galvaniſm is, as M. Volta ſuppoſes, the reſult of the action of two dry conductors, which touch each other immediately on one hand, while at their other extremities they touch conductors of what he calls the ſecond claſs, (that is, moiſture, for all the conductors of the ſecond claſs contain water), and that the bodies of animals act merely as moiſture.

One of M. Humboldt's experiments related above, appears to us to ſtrengthen the concluſion, that the influence diſcovered by Galvani is ſomething perfectly foreign to the bodies of animals. Can it be ſuppoſed that any ſubſtance which naturally reſides in our bodies, ſhould, in a few ſeconds after it is put in motion, convert the ſimple ſerous diſcharge of a bliſter into a dark coloured fluid, of a nature ſo acrid as to irritate and violently inflame the ſkin wherever it touches it? We do not ſay that this is impoſſible, for we are too little acquainted with the laws of ſecretion to ſay with certainty what may, or what may not, produce ſuch a change; but we know no ſimilar alteration produced *in a few ſeconds*, by a mere change of action in the veſſels themſelves.

35 The cauſe which produces the galvanic effects unknown.

We ſhall not undertake to determine the nature of the cauſe which produces ſuch aſtoniſhing effects. We think it is certainly not the electric fluid, and probably ſomething which reſides or is formed in the excitatory arc, but we conſider our knowledge of galvaniſm as ſtill in its infancy, and our ſtock of facts as infinitely too ſmall to admit of our forming a juſt theory on the ſubject. Fortunately, however, the diſcovery of Galvani has attracted ſo much the attention of philoſophers in every part of Europe, that new facts may be expected to come to light every day; and we hope the time is not very diſtant, when theſe may be ſo claſſed, as to entitle the ſubject to be ranked among the ſciences.

While this article was in the preſs, we were favoured by a friend with an account of ſome German diſſertations on the ſubject, which we are obliged to inſert in this irregular manner.

Mr Creve, ſurgeon in Wurtzburg, had an opportunity of obſerving the galvanic irritation on the leg of a boy, which had been amputated far above the knee in the hoſpital of that city. Immediately after the amputation, Mr Creve laid bare the crural nerve (kniekehlnerven) and ſurrounded it with a ſlip of tinfoil. He touched, at once the tinfoil and the nerve with a French crownpiece. In that inſtant the moſt violent convulſions took place in the leg both above and below the knee. The remainder of the thighbone bent with force toward the calf; the foot was more bent than extended. All theſe motions were made with much force and rapidity. None were produced when the tinfoil was taken away, or when a ſteel pincer was uſed in place of a piece of ſilver, or when the tin or ſilver was covered with blood: but they were renewed when theſe obſtacles were removed. Theſe phenomena continued till 38 minutes after the amputation, when the limb became cold.

Dr Chriſtopher Heinrich Pfaff (*in Diſſertatione de Electricitate Animali*, Stutgardt, 1793: ſee alſo Gren's *Journal der Phyſik*, T. viii. p. 196, &c.) has claſſed the phenomena in a very orderly and perſpicuous manner; and the reſult of the numerous experiments made by himſelf and others correſponds very nearly with our inferences in the preceding pages.

I. *Phenomena of muſcular contraction.*

The general form of his experiments is the ſame with that which we have placed at the beginning of this article; but the following varieties were obſerved:

The nerve being coated with tinfoil, it was always obſerved that the contractions were ſtronger when the ſilver firſt touched the muſcle, and then the coating. If it touched the coating firſt, the effects were always, and very ſenſibly, weaker.

They were ſtill ſtronger when the ſilver did not touch the muſcle at all, but only the nerve and its coating.

When the contractions were weaker at the beginning, they alſo ceaſed ſooner.

No contraction enſued from touching the coating only, or the nerve only, or the muſcle only, with the ſilver.

Continuing the contact did not occaſion any repetition of the contractions, except in ſome caſes, where the ſilver was drawn along different parts of the coating, while its other end remained in contact with the nerve.

The contractions took place only in the muſcles to which the nerve led.

Their ſtrength and duration were greater when the ſurfaces of contact were greater, and when the two metals touched each other in points or ſharp edges.

A ligature, with a ſilk thread below the coating (that is, between the coating and the muſcle, or part of the nerve touched by the ſilver), prevented all contraction; but not if the ligature was between the coating and the brain. If the nerve was cut through below the coating, and the parts ſeparated a quarter of an inch, no contraction followed by touching the coating and the nerve or muſcle: but it took place, if the parts were brought into contact; or even if a piece of any other nerve was put between the parts.

If a conſiderable part of a bared nerve was inſulated and coated, partly with tinfoil and partly with ſilver, contractions were produced in the muſcle to which it led whenever the two metals were brought into contact.

If one crural nerve be coated with tin, and the other with ſilver, contractions are produced in both legs by bringing the metals into contact.

If the nerve be dry under the coating, or when the ſilver touches it, or in both places, we have no contractions; but they begin as ſoon as we moiſten the nerve.

Dr Pfaff infers from theſe phenomena, that the nerve alone is ſubject to the irritation produced by the two metals.

If the prepared frog be immerſed in water, ſo that the coating touches the water, contractions are produced by touching the coating above water with the ſilver, while another part of the ſilver touches the nerve, or the muſcle, or even dips pretty deep in the water.

No ſuch thing happens in oil; or, at beſt, the contractions are very ſlight.

Dr Pfaff could not produce contractions without employing two metals, or a metal and charcoal.

A very thin covering of muſcular fleſh on the nerve did not altogether prevent the contractions, and in many caſes did not ſenſibly diminiſh them.

If a piece of ſilver be laid on the muſcles of the breaſt or belly, and be brought into contact with the tin-coating on the lumbal region, only the muſcles of the breaſt or belly are affected, but not thoſe of the legs.

Dr Pfaff ſays, that the involuntary muſcles are not affected by galvaniſm; and refers for convincing proofs to a diſſertation by Dr Ludwig, ſhewing that the heart is not furniſhed with nerves, (*Scriptor. neurolog. minor. ſelect.* vol. 2.).

II. *Irritation of the Organs of Senſe.*

Here Dr Pfaff's diſſertation contains nothing remarkable.

III.

III. *Conjectures as to the Cauſe.*

Dr Pfaff uſes the ſame arguments that we have employed to refute the opinion of a ſimilarity between the animal organs and the Leyden phial, and the opinion that electricity is the agent. He mentions the opinion of thoſe who maintain that the agent is a fluid put into motion by means of its relation to the metals only, in their action on each other, and who conſider the animal as merely ſerving as a conductor; and alſo ſerving, by its irritability, to give us the information of the preſence of ſuch a fluid, in the ſame manner as another kind of irritation, ſomewhat analogous to it, indicates the preſence and agency of the electric fluid. It may therefore be called the METALLIC IRRITATION; a term which will ſufficiently diſtinguiſh it.

But Dr Pfaff ſeems rather to think that the agent reſides in the animal, and that the metals are the conductors (See a diſſertation, entitled, *Farther Contributions to the Knowledge of Animal Electricity*, in *Gren's Journal der Phyſik*, T. viii. p. 377). This fluid he conceives to be intimately blended with the *principle of life*; nay, perhaps, to be the ſame. He mentions a thought of Profeſſor Kielmayer, "that it may reſemble the magnetic fluid in its manner of acting, giving connection to the diſtant particles of a nerve, as we obſerve a magnet give an inſtantaneous connection to each of a parcel of iron filings; all of which it would arrange in a certain preciſe manner, if they were ſufficiently moveable, by giving momentary polarity to each." This ſomewhat reſembles Newton's hypothetical whim read to the Royal Society, deſcribing what may be done by means of an æther (See *Birche's Hiſtory of the Royal Society*).

But all this is vague conjecture, and merits little attention. This will be better beſtowed on an obſervation of M. Humboldt of Jena, "that a bit of freſh morelle (the *Helvella mitra* of Linnæus) may be ſubſtituted for a bit of nerve in the animal arc in theſe experiments." This is the only vegetable ſubſtance yet diſcovered to have this property. If the nerve be laid on the morelle, we have only to touch the morelle with the zinc, and the muſcular contractions immediately follow.

GALWAY, a townſhip in the new county of Saratoga, in New-York. By the ſtate cenſus of 1796, it appears that 491 of its inhabitants are qualified to be electors.—*Morse.*

GAMBLE's *Station*, a fort about 12 miles from Knoxville, in Tenneſſee.—*ib.*

GAMMON, POINT, anciently called Point Gilbert, by Goſnold, forms the eaſtern ſide of the harbor of Hyanis or Hyennes, in Barnſtable co. Maſſachuſetts. —*ib.*

GARAZU, a town in Brazil, and province of Pernambuco, 25 miles N. of Olinda.—*ib.*

GARDECAUT, or GUARD DU CORD, in a watch, is that which ſtops the fuſee when wound up, and for that end is driven up by the ſpring. Some call it Guard-cock; others Guard du Gut.

GARDEN (Francis), better known to the public by the title of *Lord Gardenſtone*, was born at Edinburgh June 24th, in the year 1721. His father was Alexander Garden of Troup; an opulent landholder in Aberdeenſhire; his mother was Jane, daughter of Sir Francis Grant of Cullen, S. C. I.

After paſſing through the uſual courſe of liberal education at the ſchool and the univerſity, he betook himſelf to the ſtudy of law for his profeſſion. In the year 1744 he was admitted a member of the Faculty of Advocates, and called to the Scottiſh bar.

In his practice as an advocate he ſoon began to be diſtinguiſhed, by a ſtrong, native rectitude of underſtanding; by that vivacity of apprehenſion and imagination, which is commonly denominated *Genius*; by manly candour in argument, often more perſuaſive than ſubtlety and ſophiſtical artifice; by powers which, with diligence, might eaſily attain to the higheſt eminence of the profeſſion. But the ſame ſtrength, openneſs, and ardour of mind, which diſtinguiſhed him ſo advantageouſly among the pleaders at the bar, tended to give him a fondneſs for the gay enjoyments of convivial intercourſe, which was unfavourable to his progreſs in juridical erudition. Shining in the ſocial and convivial circle, he became leſs ſolicitouſly ambitious than he might otherwiſe have been, of the character of an eloquent advocate, or of a profound and learned lawyer. The vivacity of his genius was averſe from auſtere and plodding ſtudy, while it was captivated by the faſcinations of polite learning, and of the fine arts. Nor did he always eſcape thoſe exceſſes in the purſuit of pleaſure into which the temptations of opening life are apt, occaſionally, to ſeduce the moſt liberal and ingenuous youth. But his cheerful conviviality, his wit, humour, taſte, good-nature, and benevolence of heart, rendered him the delight of all his acquaintance. He became his Majeſty's Solicitor July 3d, 1764.

At length the worth of his character, and his abilities as a lawyer, recommended him to the office of a Judge in the Courts of Seſſion and Juſticiary, the ſupreme judicatures, civil and criminal, for Scotland. His place in the Court of Seſſion he continued to occupy till his death; but had, ſome years before, reſigned the office of a Commiſſioner of Juſticiary, and in recompence got a penſion of 200l. per annum. Clear diſcernment, ſtrong good ſenſe, conſcientious honeſty, and amiable benevolence, remarkably diſtinguiſhed all his opinions and conduct as a judge.

We not unfrequently ſee the gay young men of the preſent age, to turn, as they advance towards middle life, from the headlong purſuit of pleaſure to a ſordid and contracted ſelfiſhneſs, which excludes even thoſe few good qualities that ſeemed to accompany their firſt thoughtleſs days. Their life is divided between ſenſuality and that anxious *inhumane* avarice and ambition whoſe ultimate object is, to provide gratifications to ſenſuality and pride. The kindling light of rectitude, and the firſt ſparks of generous humanity, are extinguiſhed in their breaſts, as ſoon as thoſe ebullitions of youthful paſſion and inexperience are over, by which the uſeful efficiency of their early good qualities was prevented. Hardly have they become tolerably well acquainted with mankind, when the milk of human kindneſs is turned into gall and venom in their hearts.

It was far otherwiſe with Lord Gardenſtone. As he advanced in years, humanity, taſte, public ſpirit, became ſtill more and more eminently the predominant principles in his mind.—He pitied the condition of the peaſantry, depreſſed rather by their ignorance of the moſt ſkilful modes of labour, and by their remoteneſs from the ſphere of improvement, than by any tyranny or extortion of their landlords. He admired, protected, and cultivated the polite arts. He was the ardent votary of political liberty, and friendly to every thing that promiſed a feaſible amelioration of public economy, and the principles of government.

In the year 1762 he purchaſed the eſtate of Johnſton, in the county of Kincardine. Within a few years after he began to attempt a plan of the moſt liberal improvement of the value of this eſtate, by an extenſion of the village of Laurencekirk, adjoining. He offered leaſes of ſmall farms, and of ground for building upon, which were to laſt for the term of one hundred years; and of which the conditions were extremely inviting to the labourers and tradeſmen of the ſurrounding country. Theſe offers were eagerly liſtened to. More deſirous to make the attempt beneficial to the country than to derive profit from it to himſelf, he was induced, within a few years, to reduce his ground-rents to one-half of the original rate.—Weavers, joiners, ſhoe-makers, and other artiſans in a conſiderable number, reſorted to ſettle in the riſing village. His Lordſhip's earneſtneſs for the ſucceſs of his project, and to promote the proſperity of the good people whom he had received under his protection, led him to engage in ſeveral undertakings by the failure of which; he incurred conſiderable loſſes. Projects of a print-field, and of manufactures of linen and of ſtockings, attempted with ſanguine hopes in the new village, and chiefly at his Lordſhip's riſk and expence, miſgave in ſuch a manner as might well have finally diſguſted a man of leſs ſteady and ardent philanthropy with every ſuch engagement. But the village ſtill continued to advance. It grew up under his Lordſhip's eye, and was the favourite object of his care. In the year 1779, he procured it to be erected into a burgh of barony; having a magiſtracy, an annual fair, and a weekly market. He provided in it a good inn for the reception of travellers; and with an uncommon attention to the entertainment of the gueſts who might reſort to it, furniſhed this inn with a library of books for their amuſement. He invited an artiſt for drawing, from the continent, to ſettle at Laurencekirk. He had the pleaſure of ſeeing a conſiderable linen manufacture at length fixed in it. A bleachfield was alſo eſtabliſhed as a natural counterpart to the linen-manufacture. Before his Lordſhip's death, he ſaw his plan of improving the condition of the labourers, by the formation of a new village at Laurencekirk, crowned with ſucceſs beyond his moſt ſanguine hopes. He has acknowledged, with an amiable frankneſs, in a memoir concerning this village, "That he had tried, in ſome meaſure, a variety of the pleaſures which mankind purſue; but never reliſhed any ſo much as the pleaſure ariſing from the progreſs of this village."

In the year 1785, upon the death of his elder brother Alexander Garden of Troup M. P. for Aberdeenſhire, Lord Gardenſtone ſucceeded to the poſſeſſion of the family eſtates, which were very conſiderable. Until this time his Lordſhip's income had never been more than adequate to the liberal expence into which his rank and the generoſity of his nature, unavoidably led him. But the addition of a fortune of about three thouſand pounds a-year to his former revenue, gave him the power of performing many acts of beneficence with which he could not before gratify his good heart. It was happy, likewiſe, that his ſucceſſion to this ample income, at a period when the vigour of his conſtitution was rapidly yielding to the infirmities of old age, enabled him to ſeek relief, by a partial ceſſation from buſineſs, by travel, and by other means, which could not have been eaſily compatible with the previous ſtate of his fortune.

In the month of Sept. 1786, he ſet out from London for Dover, and paſſed over into France. After viſiting Paris, he proceeded to Provence, and ſpent the winter months in the genial climate of Hieres. In the ſpring of 1787 he returned northwards, viſiting Geneva, Switzerland, the Netherlands, and the Dutch provinces, and paſſing through Germany into Italy. With a fond curioſity, attentive alike to the wonders of nature, to the noble monuments of the arts, and to the awful remains of ancient grandeur, with which Italy abounds, he viſited all its great cities, and ſurveyed almoſt every remarkable and famous ſcene that it exhibits.

His firſt object, in theſe travels, was to obtain the reſtoration of his declining health by the influence of a milder climate, by gentle, continued, and varied exerciſe; by that pleaſing exhilaration of the temper and ſpirits which is the beſt medicine to health, and is moſt ſucceſsfully produced by frequent change of place, and of the objects of attention. But the curioſities of nature and art, in thoſe countries through which he travelled, could not fail to attract, in a powerful manner, the curioſity of a mind cultivated and ingenious as his. He, whoſe breaſt glowed with the moſt ardent philanthropy, could not view the varied works and manners of a diverſity of nations of his fellow men, without being deeply intereſted by all thoſe circumſtances which might appear to mark their fortunes as happy or wretched. He eagerly collected ſpecimens of the ſpars, the ſhells, the ſtrata of rocks, and the veins of metals, in the ſeveral countries through which he paſſed. He amaſſed alſo cameos, medals, and paintings. He enquired into ſcience, literature, and local inſtitutions. He wrote down his obſervations, from time to time; not indeed with the minute care of a pedant, or the oſtentatious labour of a man travelling with a deſign to publiſh an account of his travels; but ſimply to aid memory and imagination in the future remembrance of objects uſeful or agreeable.

After an abſence of about three years, he returned to his native country. The laſt years were ſpent in the diſcharge of the duties of his office as a judge; in ſocial intercourſe with his friends, among whom was the venerable Lord Monboddo, and others of the moſt reſpectable characters which that country has to boaſt of; in the performance of a thouſand generous offices of benevolence and humanity; in cheriſhing thoſe fine arts, of which he was an eminent admirer and judge;

and above all, in promoting the comfort, and encouraging the induſtry of his dependants, and in lending his aid to every rational attempt at the improvement of public economy and public virtue.

St Bernard's Well, in the neighbourhood of Edinburgh, had been, long ſince, diſtinguiſhed for the medicinal virtues of its waters. But various circumſtances had alſo concurred of late to throw it into neglect. Yet its waters being ſtrongly mineralized by a ſulphurated hydrogenous gas, were, by this means, unqueſtionably qualified to operate, with highly beneficial effects, in the cure of various diſeaſes. The qualities of this mineral water falling under Lord Gardenſtone's notice, he was induced to purchaſe the property of the well, to direct it to be cleared from ſurrounding obſtacles, which contaminated the virtues of the water, or made it inacceſſible; to erect a beautiful and commodious edifice over it; and to appoint proper perſons to diſtribute the water, for a very trivial compenſation, to the public. The well lies at a diſtance from Edinburgh, which is very convenient for a ſummer morning's walk. Within the few years which have paſſed ſince Lord Gardenſtone's benevolent care brought it into notice, it has attracted many of the inhabitants of that city to viſit in the mornings of ſpring and ſummer. And, undoubtedly, the agreeable exerciſe to which they have thus been allured, and the ſalutary effects of the water, have contributed, in no mean degree, to diſpel diſeaſe, and to confirm or re-eſtabliſh health. Such monuments are worthy to preſerve the memory of a patriotic and a good man!

As an amuſement for the laſt two or three years of his life, when his increaſing infirmities precluded him from more active exerciſe, and from mingling ſo frequently in the ſociety of his friends as was agreeable to his ſocial and convivial temper, he bethought himſelf of reviſing ſome of the *jeux d'eſprit*, and light fugitive pieces, in which he had indulged the gaity of his fancy in his earlier days; and a ſmall volume of poems was publiſhed, in which the beſt pieces are, upon good authority, aſcribed to Lord Gardenſtone. He reviſed alſo the memorandums which he had made upon his travels, and permitted them to be ſent to preſs. The two former volumes were publiſhed one after another while his Lordſhip was yet alive; the third after his death. They met with a very favourable reception in the world, and were honoured with the high approbation of the moſt reſpectable writers of periodical criticiſm. They convey much agreeable information, and beſpeak an elegant, enlightened and amiable mind. The laſt volume is filled chiefly with memorandums of his Lordſhip's travels in Italy; and contains many intereſting criticiſms upon ſome of the nobleſt productions of the fine arts of painting and ſculpture.

His Lordſhip's health had long been declining; and he died a bachelor on the 22d of July 1793, lamented by his relations and friends, by his tenants and humble dependants, and by all true patriots and good men to whom his merits and virtues were known.

Such is the account of Lord Gardenſtone's life, which was prefixed to the third volume of his travelling memorandums; and though it was no doubt an effuſion of fond friendſhip, we believe that the praiſe which it beſtows on his Lordſhip is not much exaggerated. In the latter years of his life, it muſt indeed be confeſſed, that he contracted intimacies with men unworthy of his regard; and that his attachment to liberty made him form expectations from the French revolution, which even the events which he ſaw ought to have repreſſed. But his mind was by that time weakened by diſeaſe; and it would be very unjuſt to balance the imprudencies of one or two years againſt the meritorious actions of a whole life. Beſides his travelling memorandums and his poems, his Lordſhip publiſhed *a Letter to the Inhabitants of Laurencekirk*, the moſt valuable, in our opinion, of all his publications; for it contains perhaps the moſt ſalutary advices which were ever offered to the inhabitants of a manufacturing town, for the regulation of their conduct towards each other. That the people of Laurencekirk have followed theſe advices, it would give us pleaſure to learn on good authority.

GARDNER, a townſhip in Worceſter co. Maſſachuſetts, incorporated in 1785. It contains about 14,000 acres, well watered, chiefly by Otter river. The road from Connecticut river, through Peterſham, Gerry, and Templeton on to Boſton, paſſes through it. It contains 531 inhabitants, and is 26 miles N. by W. of Worceſter, and 60 N. W. of Boſton.—*Morſe.*

GARDNER's *Iſland*, or *Iſle of Wight*, lies at the E. end of Long-Iſland, in New-York ſtate, ſheltered within Oyſter Pond and Montauk points; 10 miles N. W. of the latter, and as far S. W. of Plumb Iſland. It contains about 3000 acres of fertile land, the property of one perſon, and yields excellent graſs, wheat and corn. Fine ſheep and cattle are raiſed on it. It is annexed to Eaſt Hampton, and lies 40 miles ſouth-weſterly of Newport, Rhode Iſland.—*ib.*

GAS. See that article, *Encycl.* and CHEMISTRY—*Index* in this *Supplement*. We have introduced the word here, to notice ſome experiments made by Profeſſor Jacquin of Vienna, at the deſire of Dr Chladni, on the different gaſes as the vehicle of ſounds. A glaſs bell was furniſhed with a metallic ſtopper cemented to a neck at the top: and in the bore of this cock, within the glaſs, a ſmall flute or pewter (etain) about ſix inches in length was fixed. The glaſs being then placed on the ſhelf of the pneumatic veſſel, and filled with any particular kind of gas, a bladder alſo filled with the ſame gas, and provided with a cock, was adapted to the external aperture of the cock belonging to the bell-glaſs. In this diſpoſition of the apparatus, the flute was made to ſound by gently preſſing the bladder. Comparative experiments were made with atmoſpheric air, oxygen, hydrogen, carbonic acid, and nitrous gas. The intenſity of the ſound did not vary; but when compared with that produced by atmoſpheric air, the oxygen gas gave a ſound half a tone lower; azotic gas, prepared by different methods conſtantly gave a ſound half a tone lower; hydrogen gas gave nine or eleven tones higher; carbonic acid gas gave one-third lower, and nitrous gas alſo very nearly a third lower. A mixture of oxygen gas and azote, in the proportions of the atmoſpheric air, afforded the tone of this laſt; that is to ſay, it was half a tone higher than each of the component parts alone. When the two gaſes were not uniformly mixed, the ſound was abominably harſh. Chladni intends to give a fuller account of theſe intereſting experements. *Journal de Phyſique*, Vol. IV. N. S. p. 57.

GASPEE, or *Namquit Point*, 7 miles S. of Providence (Rhode Iſland) projecting from the weſtern ſhore of Providence river, remarkable as being the place where the Britiſh armed ſchooner, called the Gaſpee, was burnt, June 10, 1772, by about 60 men from Providence, painted like Narraganſet Indians. For the cauſe of this tranſaction, ſee Gordon's Hiſt. of the Amer. Rev. vol. I. p. 311.—*Morſe.*

GASPESIA, a tract of country on the S. ſide of the mouth of St Lawrence river, and on the N. ſide of Chaleurs bay, in Lower Canada. Its E. extremity is Cape Roſiers. The Indians called Gaſpeſians inhabit here.—*ib.*

GATES *Co.* in Edenton eaſtern diſtrict, N. Carolina, is bounded N. by the ſtate of Virginia, S. by Chowan co. It contains 5392 inhabitants, including 2219 ſlaves. Chief town, Hertford.—*ib.*

GAY *Head*, is a kind of peninſula on Martha's Vineyard, between 3 and 4 miles in length and 2 in breadth, and almoſt ſeparated from the other part of the iſland by a large pond. The Indians inhabiting this part, when lately numbered, amounted to 203. The ſoil is good, and only requires cultivation to produce moſt vegetables in perfection. There are evident marks of there having been volcanoes formerly on this peninſula. The marks of 4 or 5 craters are plainly to be ſeen. The moſt ſoutherly and probably the moſt ancient, as it is grown over with graſs, now called the Devil's Den, is at leaſt 20 rods over at the top, 14½ at the bottom, and full 130 feet at the ſides, except that which is next the ſea, where it is open. A man now alive relates that his mother could remember when it was common to ſee a light upon Gay Head in the night time. Others ſay, their anceſtors have told them, that the whalemen uſed to guide themſelves in the night by the lights that were ſeen upon Gay Head. The ſea has made ſuch encroachments here, that, within 30 years, it has ſwept off 15 or 20 rods. The extremity of Gay Head is the S. W. point of the Vineyard. N. lat. 41. 20. W. long. from Greenwich 70. 50.—*ib.*

GAZONS, in fortification, turfs, or pieces of freſh earth covered with graſs, cut in form of a wedge, about a foot long, and half a foot thick, to line or face the outſide of works made of earth, to keep them up, and prevent their mouldering.

GENESSEE *Country*, a large tract of land in the ſtate of New-York, bounded N. and N. W. by lake Ontario, S. by Pennſylvania, E. by the weſtern part of the military townſhips, in Onondago co. and W. by lake Erie and Niagara river. It is a rich tract of country, and well watered by lakes and rivers; one of the latter, Geneſſee river, gives name to this tract. It is generally flat, the rivers ſluggiſh, the ſoil moiſt, and the lakes numerous.—*Morſe.*

GENEVA, a lake in Upper Canada, which forms the W. extremity of lake Ontario; to which it is joined by a ſhort and narrow ſtrait.—*ib.*

Geneva, a poſt town in Onondago co. New-York, on the great road from Albany to Niagara, ſituated on the bank of the N. W. corner of Seneca lake, about 74 miles W. of Oneida caſtle, and 92 W. of Whiteſtown. The Friends ſettlement lies about 18 miles below this. Here were 20 log-houſes, and a few other buildings ſeveral years ago, which have much increaſed ſince.—*ib.*

Genevieve, St or *Miſſire*, a village in Louiſiana, on the weſtern bank of the Miſſiſſippi, nearly oppoſite to the village of Kaſkaſkias, 12 miles ſoutherly of Fort Chartres. It contained about 20 years ago, upwards of 100 houſes, and 460 inhabitants, beſides negroes.—*ib.*

GEOCENTRIC Place of a planet, is the place where it appears to us from the earth; or it is a point in the ecliptic, to which a planet, ſeen from the earth, is referred.

Geocentric Latitude of a planet, is its latitude as ſeen from the earth, or the inclination of a line connecting the planet and the earth to the plane of the earth's (or true) ecliptic: Or it is the angle which the ſaid line (connecting the planet and the earth) makes with a line drawn to meet a perpendicular let fall from the planet to the plane of the ecliptic.

Geocentric Longitude of a planet, is the diſtance meaſured on the ecliptic, in the order of the ſigns, between the geocentric place and the firſt point of Aries.

GEOMETRICAL Method of the Ancients. The ancients eſtabliſhed the higher parts of their geometry on the ſame principles as the elements of that ſcience, by demonſtrations of the ſame kind: and they were careful not to ſuppoſe any thing done, till by a previous problem they had ſhewn that it could be done by actually performing it. Much leſs did they ſuppoſe any thing to be done that cannot be conceived; ſuch as the line or ſeries to be actually continued to infinity, or a magnitude diminiſhed till it become infinitely leſs than what it is. The elements into which they reſolved magnitudes were finite, and ſuch as might be conceived to be real. Unbounded liberties have of late been introduced; by which geometry, which ought to be perfectly clear, is filled with myſteries.

Geometrical Solution of a problem, is when the problem is directly reſolved according to the ſtrict rules and principles of geometry, and by lines that are truly geometrical. This expreſſion is uſed in contradiſtinction to an arithmetical, or a mechanical, or inſtrumental ſolution, the problem being reſolved only by a ruler and compaſſes.

The ſame term is likewiſe uſed in oppoſition to all indirect and inadequate kinds of ſolutions, as by approximation, infinite ſeries, &c. So we have no geometrical way of finding the quadrature of the circle, the duplicature of the cube, or two mean proportionals, though there are mechanical ways, and others, by infinite ſeries, &c.

GEORGE's, St a cape and iſlands nearly oppoſite to the river Apalachicola, on the coaſt of E. Florida. Cape St George's lies about 6 leagues to the eaſtward of Cape Blaize, being an elbow of the largeſt of St George's iſlands, in N. lat. 29 38. There is a large ſhoal running out from it a conſiderable way, but how far has not yet been aſcertained. The coaſt between it and Cape Blaize, forms a kind of hollow bay, with deep ſoundings and a ſoft bottom. There are two iſlands to the N. W. of St George's Cape; that neareſt to it is ſmall, and remarkable for a clump of ſtraggling trees on the middle of it; the other is pretty large, and of a triangular form, and reaches within 3 leagues of Cape Blaize, having a paſſage at each end of it for ſmall craft into the bay, between theſe iſlands and the river Apalachicola; but this bay is full of ſhoals and oyſter-banks, and not above two or three feet water at moſt, in any of the branches of that river.—*Morse.*

George, Fort, was ſituated on Point Comfort, at the mouth of James river, and 5 miles N. E. of Craney iſland, at the mouth of Elizabeth river, in Virginia.—*ib.*

George, Fort King, an ancient fort in Georgia, which ſtood 5 miles N. E. of the town of Darien, in Liberty co. ſituated at the head of a creek which flows into the ocean oppoſite Sapelo iſland. It is now in ruins.—*ib.*

George, Lake, in Eaſt Florida, is a dilatation of the river St Juan, or St John, and called alſo Great Lake. It is about 15 miles wide, and generally about 15 or 20 feet deep, excepting at the entrance of the river, where lies a bar, which carries 8 or 9 feet water. The lake is beautified with two or three fertile iſlands. The largeſt is about 2 miles broad, and commands a moſt delightful and extenſive proſpect of the waters, iſlands, E. and W. ſhores of the lake, the capes, the bay and mount Royal; and to the S. the view is very extenſive. Here are evident marks of a large town of the aborigines, and the iſland appears to have been once the choſen reſidence of an Indian prince. On the ſcite of this ancient town ſtands a very pompous Indian mount, or conical pyramid of earth, from which runs in a ſtraight line, a grand avenue or Indian highway, through a magnificent grove of magnolias, live oaks, palms and orange trees, terminating at the verge of a large, green, level ſavanna. From fragments dug up it appears to have been a thickly inhabited town.—*ib.*

George, Lake, lies to the ſouthward of lake Champlain, and its waters lie about 100 feet higher. The portage between the two lakes is a mile and a half; but with a ſmall expenſe might be reduced to 60 yards; and with one or two locks might be made navigable through, for batteaux. It is a moſt clear, beautiful collection of water; 36 miles long, and from 1 to 7 wide. It emboſoms more than 200 iſlands, ſome ſay 365; very few of which are any thing more than barren rocks, covered with heath, and a few cedar, ſpruce and hemlock trees, and ſhrubs, and abundance of rattle-ſnakes. On each ſide it is ſkirted by prodigious mountains; from which large quantities of red cedar are annually carried to New-York for ſhip-timber. The lake is full of fiſhes, and ſome of the beſt kind, as the black or Oſwego baſs, alſo large ſpeckled trouts. It was called lake Sacrament by the French, who, in former times, were at the pains to procure this water for ſacramental uſes in all their churches in Canada: hence probably it derived its name. The remains of Fort George ſtand at the S. end of the lake, about 14 miles N. by W. of Fort Edward, on Hudſon river. The famous fort of Ticonderoga, which ſtood on the N. ſide of the outlet of the lake, where it diſcharges its waters into lake Champlain, is now in ruins.—*ib.*

Georges, St an iſland and pariſh belonging to the Bermuda iſles, in the Weſt-Indies. N. lat. 32. 45. W. long. 63. 30.—*ib.*

George's St a large and deep bay on the W. ſide of Newfoundland iſland. N. lat. 48 12.—*ib.*

George's Bank, St a fiſhing bank in the Atlantic ocean, E. of Cape Cod, in Maſſachuſetts. It extends from N. to S. between 41. 15. and 42. 22. N. lat. and between 67. 50. and 68. 40. W. long.—*ib.*

Geoege's Key, St was one of the principal Britiſh ſettlements in the bay of Honduras. It was taken by the Spaniards during the American war, but retaken by the Britiſh ſoon after.

The Britiſh ſettlements on the Moſquito ſhore, and in the bay of Honduras, were ſurrendered to the crown of Spain, at the Spaniſh convention, ſigned at London, the 14th of July, 1786.—*ib.*

George's River, St in St Mary's co. Maryland, is a very broad but ſhort creek, whoſe mouth lies between Piney Point and St Mary's river, on the N. bank of the Potowmack, oppoſite the iſland of the ſame name.—*ib.*

George's River, St in Lincoln co. diſtrict of Maine, or rather an arm of the ſea, lies about 2 leagues S. W. of Penobſcot bay. Four leagues from the mouth of this river ſtands Thomaſton. This river is navigable for brigs and ſhips of a large burden up to the narrows; and from thence about 4 miles higher, to nearly the head of the tide, for ſloops and ſchooners of 80 or 90 tons. It is about half a league wide up to the narrows. Of late ſeveral conſiderable veſſels have been built in this river, which are employed in coaſting, and ſometimes in foreign voyages. There are now owned in this river, though it does not in all exceed 4 leagues in length, 1 brig, 2 topſail ſchooners, and 9 ſloops: In all about 1100 tons. The navigation, however, is generally interrupted in winter, when not only the ſtreams through the country, but the ſalt water rivers are locked up until ſpring. Fiſh abound here, of almoſt all kinds, in their ſeaſon; and even lobſters, oyſters, clams, and other delicacies of the aqueous kind, are plenty in this river.—*ib.*

George's, St a village nearly in the centre of Newcaſtle co. Delaware, on a creek of its own name, which falls into Delaware river, 4 miles below, a little above Reedy Iſland. It is 17 miles S. by W. of Wilmington, and 45 S. W. of Philadelphia.—*ib.*

Georges, St the capital of the iſland of Grenada, in the Weſt-Indies; formerly called Fort Royale, which name the fort ſtill retains. It is ſituated on a ſpacious bay, on the W. or lee-ſide of the iſland, not far from the S. end, and poſſeſſes one of the ſafeſt and moſt commodious harbors in the Britiſh W. Indies, which has lately been fortified at a very great expenſe, and declared a free port. This town was deſtroyed by a dreadful fire in 1771, and on November 1, 1775, it met with the like misfortune; and the loſs was valued at £.500,000. The town now makes a very handſome appearance, has a ſpacious ſquare or parade; the houſes are built of brick, and tiled or ſlated; ſome few are built of ſtone, excepting the warehouſes and dwelling-houſes round the harbor, which are moſtly wooden buildings. Theſe are in a great meaſure ſeparated from the town by a very ſteep and rocky hill, the houſes on which, with the trees which ſerve for ſhade, have a romantic appearance. The town is computed to contain about 2000 inhabitants, many of whom are wealthy merchants. This was its ſituation before the inſurrection of the negroes; of its preſent ſtate we have not authentic information.—*ib.*

GEORGETOWN, the chief town of Suſſex co. Delaware, is ſituated 16 miles W. S. W. of Lewiſtown, and 103 S. of Philadelphia. It contains about 30 houſes and has lately been made the ſeat of the county courts.—*ib.*

GEORGETOWN, a poſt town in Maryland, ſituated in Kent co. on the E. ſide of Cheſapeak bay, of about 30 houſes. It is 9 miles from the mouth of the river Saſſafras, being ſeated on the S. ſide oppoſite to Frederic, 60 N. E. of Cheſter, and 65 S. W. of Philadelphia.—*ib.*

GEORGETOWN, a village of Fayette co. Pennſylvania, ſituated on the S. E. ſide of Monongahela river, at the mouth of George's creek. Here a number of boats are annually built for the trade and emigration to the weſtern country. It lies 16 miles S. W. of Union.—*ib.*

GEORGETOWN, a poſt town and port of entry, in Montgomery co. Maryland, and in the territory of Columbia. It is pleaſantly ſituated on a number of ſmall hills, upon the northern bank of Potowmack river; bounded eaſtward by Rock creek, which ſeparates it from Waſhington city, and lies 4 miles from the capitol, and 8 N. of Alexandria. It contains about 230 houſes, ſeveral of which are elegant and commodious. The Roman Catholics have eſtabliſhed a college here, for the promotion of general literature, which is at preſent in a very flouriſhing ſtate. The building being found inadequate to contain the number of ſtudents that applied, a large addition has been made to it. Georgetown carries on a ſmall trade with Europe and the W. Indies. The exports in one year, ending Sept. 30, 1794, amounted to the value of 128,924 dollars. It is 46 miles S. W. by W. of Baltimore, and 148 S. W. of Philadelphia.—*ib.*

GEORGETOWN, in Lincoln co. diſtrict of Maine, is ſituated on both ſides of Kenebeck river. It was incorporated in 1716, is the oldeſt town in the county, and contains 1333 inhabitants. It is bounded ſoutherly by the ocean, weſterly by the towns of Harpſwell and Brunſwick, N. weſterly by Bath, and eaſterly by Woolwich; being entirely ſurrounded by navigable waters, excepting about 2 miles of land, which divides the waters of Winnagance creek, a part of the Kennebeck, from an arm or influx of Caſco bay, called Stephen's river.

The entrance at the mouth of Kennebeck river, is guided on the E. by Parker's iſland, belonging to this townſhip. It contains about 28,000 acres of land and ſalt marſh, and is inhabited by more than one third part of the people of the townſhip. This was the ſpot on which the Europeans firſt attempted to colonize New-England, in the year 1607. It is a part of what was called Sagadahock; and the patentees of the Plymouth company began here to lay the foundation of a great ſtate. They ſent over a number of civil and military officers, and about 100 people. By various misfortunes they were forced to give up the ſettlement, and in 1608, the whole number who ſurvived the winter returned to England.

There was a tradition among the Norridgewalk Indians, that theſe planters invited a number of the natives, who had come to trade with them, to draw a ſmall cannon by a rope, and that when they were ranged in a line, the white people diſcharged the piece, and thereby killed and wounded ſeveral of them. The reſentment of the natives at this treacherous murder, obliged the Europeans to reimbark the next ſummer. Georgetown is 15 miles S. of Pownalborough, and 170 N. by E. of Boſton.—*ib.*

GEORGETOWN, a poſt town of Georgia, in the co. of Oglethorpe, 50 miles S. W. of Auguſta, ſurrounded by a poor country; but, nevertheleſs, exhibits marks of growing proſperity.—*ib.*

GEORGETOWN, a large maritime diſtrict in the lower country of S. Carolina, ſituated in the S. E. corner of the ſtate; bounded N. E. by the ſtate of N. Carolina, S. E. by the ocean, S. W. by Santee river, which divides it from Charleſton diſtrict, and N. W. by Camden and Cheraw diſtricts. It is about 112 miles from N. to S. and 63 from E. to W. and is divided into the pariſhes of All Saints, Prince George, and Prince Frederick. It contains, according to the cenſus of 1790, 22,122 inhabitants, of whom 13,131 are ſlaves. It ſends to the ſtate legiſlature 10 repreſentatives and 3 ſenators, and pays taxes to the amount of £.3585-12-6.—*ib.*

GEORGETOWN, a poſt town, port of entry, and capital of the above diſtrict, is ſituated on a ſpot near which ſeveral ſtreams unite their waters, and form a broad ſtream called Winyaw bay, 12 miles from the ſea. Its ſituation connects it with an extenſive back country of both the Carolinas, and would be a place of vaſt importance, were it not for a bar at the entrance of Winyaw bay, which interrupts the entrance of veſſels drawing above 11 feet water, and is in many reſpects a dangerous place. It contains above 300 houſes, built chiefly of wood. The public buildings are a court-houſe, gaol, and academy; 3 churches, of which the Epiſcopalians, Baptiſts, and Methodiſts have one each. There is here a ſmall trade to the Weſt-Indies. The exports for one year, ending Sept. 30, 1795, were to the value of 21,511 dollars. It is 60 miles N. E. by N. of Charleſton, 127 S. W. of Wilmington, N. Carolina, and 681 from Philadelphia. N. lat. 33. 24. W. long. 79. 35.—*ib.*

GEORGIA WESTERN TERRITORY. Under this name is included all that part of the State of Georgia which lies weſt of the head waters of thoſe rivers which fall into the Atlantic Ocean. This extenſive tract of country embraces ſome of the fineſt land in the United States, is interſected with a great number of noble rivers, which may be ſeen by an inſpection of the map, and is inhabited (except ſuch parts wherein the Indian title has been extinguiſhed) by three nations of Indians, viz. the Muſkogulge or Creek, the Chactaws, and Chicaſaws. The Cherokees alſo have a title to a ſmall portion of the northern part of this territory, on the Tenneſſee river. Theſe nations together can furniſh between 8 and 9000 warriors. About 2000 families of white people inhabit thoſe parts of this territory where the Indian title has been extinguiſhed, chiefly at the Natchez, and the Yazoo river, on the banks of the Miſſiſſippi, and a conſiderable number on the Tombigbee river, and ſcattered among the Creek Indians. This territory, for reaſons which will hereafter appear, has lately become an object of much public attention and inquiry, in Europe, as well as in the United States; and on this account, the following deſcription of it and ſtatement of facts relative to the ſale of certain parts of it, and the claims of the United States, &c. have been collected and arranged with great care from the moſt authentic ſources that can be obtained, and given under this head for the information of the public (A). This Territory, lying between the 31ſt and 35th degrees of N. latitude, is not ſubject to the extremes of heat or cold; the climate is temperate and delightful through the year; and except in low grounds, and in the neighbourhood of ſtagnant waters, is very healthful. White froſts, and ſometimes thin ice, have been ſeen as far S. as the 31ſt degree of latitude; but ſnow is very uncommon in any part of this territory. A perſon reſiding at the Natchez writes to his friend, in the eaſtern part of Georgia, that "this country affords the beſt ſpring water; every perſon almoſt is in blooming health." (B) Others who have viſited it, ſay of that part of the territory which borders on the Miſſiſſippi, that "the water is good for 20 miles back from the river, and the country healthy and pleaſant, and of all others that they have ſeen the moſt deſirable." Mr Hutchins, ſpeaking of the ſame tract, ſays, "the climate is healthy and temperate, the country delightful and well watered, and the proſpect is beautiful and extenſive; variegated by many inequalities, and fine meadows, ſeparated by innumerable copſes, the trees of which are of different kinds, but moſtly of walnut and oak. The elevated, open, and airy ſituation of this country, renders it leſs liable to fevers and agues (the only diſorders ever known in its neighbourhood) than ſome other parts bordering on the Miſſiſſippi, where the want of a ſufficient deſcent to convey the waters off, occaſions numbers of ſtagnant ponds whoſe exhalations infect the air." Another traveller deſcribes the country between the Tombigbee and the Coofa and Alabama as being healthy, well watered with many pleaſant rivulets, affording delightful ſituations for ſettlements, and the water pure and very good.

To give a juſt view of the rivers, and to aſcertain the advantages derived from them to this Territory, it is neceſſary to trace them from their mouths in the Gulf of Mexico. The Miſſiſſippi bounds this territory on the W. The free navigation of this noble river is now enjoyed by the inhabitants of the United States. It empties, by ſeveral mouths of different depths, from 9 to 16 feet, into the Gulf of Mexico, in about lat. 29 N. The bars at the mouth of this river frequently ſhift; after paſſing them into the river, there is from 3 to 10 fathoms of water, as far as the S. W. paſs; and thence to the Miſſouri, a diſtance of 1,142 computed miles, from 12, 15, 20, and 30 fathoms is the general depth.

In aſcending the Miſſiſſippi there are extenſive natural meadows, with a proſpect of the Gulf of Mexico on each ſide, the diſtance of 32 miles, to a place called Detour-aux-Plaquemines, in W. Florida. Thence 20 miles to the ſettlements, the banks are low and marſhy, generally overflowed and covered with thick wood, palmetto buſhes, &c. apparently impenetrable by man or beaſt. Thence to Detour-des-Anglois, at the bend of the river, the banks are well inhabited; as alſo from hence to New-Orleans 18 miles, which diſtance there is a good road for carriages. Veſſels paſs from the mouth of this river to New-Orleans 105 miles, in 7 or 8 days, commonly; ſometimes in 3 or 4.

From New-Orleans, the capital of Louiſiana, there is an eaſy communication with Weſt-Florida by Bayouk Creek, which is a water of lake Ponchartrain, navigable for veſſels drawing four feet water, ſix miles up from the lake, to a landing-place two miles from New-Orleans. For nearly 50 miles, as you proceed up the river, both its banks are ſettled and highly cultivated, in part by emigrants from Germany, who furniſh the market with indigo of a ſuperior quality, cotton, rice, beans, myrtle wax, and lumber. In 1762, ſome rich planters attempted the cultivation of canes and the making of ſugar, and erected mills for the purpoſe. This ſugar was of an excellent quality, and, ſome of the crops were large; but ſome winters proving ſo ſevere as to kill the canes, no dependence can be placed on the culture of that article.

The ſettlements of the Acadians, which were begun in the year 1763, extend on both ſides of the river, from the Germans, to the river Ibberville, which is 99

(A) The ſources whence the author has derived his information, in drawing up the following account, are Capt. Thomas Hutchins's "Hiſtorical narrative and topographical deſcription of Louiſiana and Weſt-Florida," comprehending alſo many of the rivers and ſettlements in the Georgia Weſtern Territory; publiſhed in 1784. Private letters and journals; minutes taken from verbal deſcriptions of gentlemen of veracity and intelligence who have reſided in that country. The journals and laws of the State of Georgia—State papers, and Reports both printed and M. S. of Congreſs, and of Agents of the ſeveral companies who have purchaſed lands in this territory.

(B) The letter here alluded to contains the following paragraphs: "Our navigation is excellent; our high lands preferable to Beach Iſland, (1) when in its bloom; ſtock is as eaſy come at as where you are; lands are riſing faſt, and I expect will be very high in a few years. The canes in common, on the high lands, larger than in the river-ſwamps, [meaning in the eaſtern part of Georgia] from 30 to 35 feet high, and upwards, and in many places ſtand ſo thick, that one can ſcarcely walk a mile in half an hour. Some families muſt be coming to this moſt flouriſhing country in the world. I wiſh you to adviſe any of my relations you ſee to come with all haſte; if they can get here, and are turned out naked in the world, in one year they might be fixed again. I am ſure could I have time to ſay as much as I wiſh to ſay, you would be with me this fall. I could venture to almoſt promiſe, if you would be wiſe and come, to make good any deficiencies you might find in the place." The author is in poſſeſſion of the original letter, above mentioned, which has every mark of authenticity; and the above extracts are inſerted, as containing the ſimple, honeſt deſcription of a plain farmer; and on which more dependence is to be placed, than on the moſt elaborate and elegant deſcriptions, of intereſted individuals.

(1) Alluding to a remarkably fertile iſland in the eaſtern part of Georgia, in the neighbourhood of the writer's correſpondent, and with which both were well acquainted.

miles above New-Orleans, and 270 from Penſacola, by way of lakes Ponchartrain and Maurepas.

At Point Coupee, 35 miles above the Ibberville, are ſettlements extending 20 miles on the W. ſide of the river, which, 30 years ago, had 2,000 white inhabitants, and 7,000 ſlaves, who were employed in the cultivation of tobacco, indigo, Indian corn, &c. for the New-Orleans market, which they furniſhed alſo with poultry, and abundance of ſquared timber, ſtaves, &c.

Mr Hutchins, from his perſonal knowledge, deſcribes the country on both ſides of the Miſſiſſippi, between the latitudes 30 and 31, bordering on Georgia, as follows:

“ Although this country might produce all the valuable articles raiſed in other parts of the globe, ſituated in the ſame latitudes, yet the inhabitants principally cultivate indigo, rice, tobacco, Indian corn, and ſome wheat; and they raiſe large ſtocks of black cattle, horſes, mules, hogs, ſheep, and poultry. The ſheep are ſaid to make the ſweeteſt mutton in the world. The black cattle, when fat enough for ſale, which they commonly are the year round, are driven acroſs the country to New-Orleans, where there is always a good market.

This country is principally timbered with all the different kinds of oak, but moſtly with live-oak, of the largeſt and beſt quality, uncommonly large cypreſs, black walnut, hickory, white aſh, cherry, plum, poplar trees, and grape vines; here is found alſo a great variety of ſhrubs and medicinal roots. The lands bordering the rivers and lakes, are generally well wooded, but at a ſmall diſtance from them are very extenſive natural meadows, or ſavannas, of the moſt luxuriant ſoil, compoſed of a black mould, about one and a half feet deep, very looſe and rich, occaſioned in part, by the frequent burning of the ſavannas; below the black mould is a ſtiff clay of different colours. It is ſaid, this clay, after being expoſed ſome time to the ſun, becomes ſo hard, that it is difficult either to break or bend, but when wet by a light ſhower of rain, it ſlackens in the ſame manner as lime does when expoſed to moiſture, and becomes looſe and moulders away, after which it is found excellent for vegetation.”

After paſſing the 31ſt degree of N. lat. from W. Florida into Georgia, you enter what is called the *Natchez Country*, bordering on the Miſſiſſippi. Fort Roſailie, in this country, is in lat. 31 40, 243 miles above New-Orleans.

“ The ſoil of this country is ſuperior to any of the lands on the borders of the river Miſſiſſippi, for the production of many articles. Its ſituation being higher, affords a greater variety of ſoil, and is in a more favourable climate for the growth of wheat, rye, barley, oats, &c. than the country lower down, and nearer to the ſea. The ſoil alſo produces in equal abundance, Indian corn, rice, hemp, flax, indigo, cotton, pot-herbs, pulſe of every kind, and paſturage; and the tobacco made here, is eſteemed preferable to any cultivated in other parts of America. Hops grow wild; all kinds of European fruits arrive to great perfection, and no part of the known world is more favourable for the raiſing of every kind of ſtock. The riſing grounds, which are cloathed with graſs and other herbs of the fineſt verdure, are well adapted to the culture of vines: the mulberry trees are very numerous, and the winters ſufficiently moderate for the breed of ſilk worms. Clay of different colours, fit for glaſs works and pottery, is found here in great abundance; and alſo a variety of ſtately timber, fit for houſe and ſhip building, &c.”

Another gentleman, well informed, (c) ſays, “ The lands on the Miſſiſſippi, extending eaſtward about 20 miles, are hilly, without ſtones or ſand, extremely rich, of a deep black ſoil, covered thick with canes, white and black oak, walnut, hickory, aſh, ſome ſugar maple, beech, and dogwood; that there are very few ſtreams or ſprings of water; that the water is not good, and taſtes as if impregnated with ſulphur; that the country is much infeſted with inſects; that the land is high and bluff three-fourths of the diſtance along the river Miſſiſſippi, and a part overflowed and drowned.” But it is apprehended that this deſcription is not perfectly juſt, ſo far as it applies to the ſcarcity and badneſs of the water; as a gentleman of reſpectable character, who reſided 9 months at the Natchez, ſays, “ The lands on the Miſſiſſippi are more level, and better watered, than is above repreſented; and that the water is good, and the country healthy and remarkably pleaſant.”

This country was once famous for its inhabitants, the Natchez Indians; who, from their great numbers, and the improved ſtate of ſociety among them, were conſidered as the moſt civilized Indians on the continent of America. Nothing now remains of this nation but their name, by which their country continues to be called. The diſtrict of the Natchez, as well as all along the eaſtern bank of the Miſſiſſippi to the river Ibberville, was ſettling very faſt by emigrations from the northern States, till the capture of the Britiſh troops on the Miſſiſſippi, 1779, put an entire ſtop to it.

“ From fort Roſailie to the Petit Goufre is 31½ miles. There is a firm rock on the eaſt ſide of the Miſſiſſippi for near a mile, which ſeems to be of the nature of lime-ſtone. The land near the river is much broken and very high, with a good ſoil, and ſeveral plantations on it. From the Petit Goufre to Stoney river, is 4½ miles. From the mouth to what is called the fork of this river, is computed to be 21 miles. In this diſtance there are ſeveral quarries of ſtone, and the land has a clay ſoil, with gravel on the ſurface of the ground. On the north ſide of this river, the land in general is low and rich; that on the ſouth ſide is much higher, but broken into hills and vales; but here the low lands are not often overflowed; both ſides are ſhaded with a variety of uſeful timber. At the fork, the river parts almoſt at right angles, and the lands between and on each ſide of them are ſaid to be clay and marl ſoil, not ſo uneven as the lands on this river lower down. From Stony river to Louſa Chitto, or Big Black river, is 10 miles. This river, at the mouth, is about 30 yards wide, but within, from 30 to 50 yards, and is ſaid to be navigable for canoes 30 or 40 leagues. About a mile and a half up this river, the high lands are cloſe on the right, and are much broken. A mile and a half further, the high lands appear again on the right, where there are ſeveral ſprings of water, but none as yet have been diſcovered on the left. At about 8 miles further, the high lands are near the river, on the left, and appear to be the ſame range that comes from the Yazoo cliffs. At ſix miles further, the high lands are near the river on both ſides, and continue for two or three miles, but broken and full of ſprings of water. This land on the left was choſen by Gen. Putnam, Capt. Enos, Mr Lyman, and other New-England adventurers, as a proper place for a town; and, by order of the governor and council of Weſt-Florida, in 1773, it was reſerved for the capital. The country round is very fit for ſettlements. For four or five miles above this place, on both ſides of the river, the land is rich, and not ſo much drowned, nor ſo uneven, as ſome parts lower down. About ſix miles and a half further, there is a rapid water, ſtones and gravel bottom, 160 yards in length; and in one place a firm rock almoſt acroſs the river, and as much of it bare, when the water is at a moderate height, as confines the ſtream to nearly 20 feet; and the channel is about four feet deep.

(c) Mr Iſaac Perry, of Burk county, Georgia.

From the Louſa Chitto to the Yazoo Cliffs, is 40 miles. From this cliff the high lands lie north-eaſtward and ſouth-ſouth-eaſtward, bearing off from the river, full of cane and rich ſoil, even on the very higheſt ridges. Juſt at the S. end of the cliffs, the bank is low, where the water of the Miſſiſſippi, when high, flows back and runs between the bank and high land, which ranges nearly northerly and ſouth-ſouth-eaſterly to the Louſa Chitto, occaſioning much wet ground, cypreſs ſwamp, and ſtagnant ponds. From the Cliffs, is ſeven miles and a half to the river Yazoo. The mouth of this river is upwards of 100 yards in width, and was found by Mr Gaul to be in lat. 32 37, and by Mr Purcell in 32 28 N. The water of the Miſſiſſippi, when the river is high, runs up the Yazoo ſeveral miles, and empties itſelf again by a number of channels, which direct their courſe acroſs the country, and fall in above the Walnut Hills. The Yazoo runs from the N. E. and glides through a healthy, fertile and pleaſant country, greatly reſembling that about the Natchez, particularly in the luxuriancy and diverſity of its ſoil, variety of timber, temperature of climate, and delightful ſituation. It is remarkably well watered by ſprings and brooks; many of the latter afford convenient ſeats for mills. Further up this river the canes are leſs frequent, and ſmaller in ſize, and at the diſtance of 20 miles there are ſcarcely any. Here the country is clear of underwood, and well watered, and the ſoil very rich, which continues to the Chactaw and Chickaſaw towns, on the eaſtern and north-weſtern branches of Yazoo river. Theſe branches unite 50 miles from the Miſſiſſippi, following the courſe of the river; the navigation to their junction, commonly called the Fork, is practicable with very large boats in the ſpring ſeaſon, and with ſmaller ones a conſiderable way further, with the interruption of but one fall, where they are obliged to make a ſhort portage, 20 miles up the N. W. branch, and 70 miles from the Miſſiſſippi. The country in which the Chactaw and Chickaſaw towns are ſituated, is ſaid to be as healthy as any part of the continent, the natives ſcarcely ever being ſick. Such of them as frequent the Miſſiſſippi, leave its banks as the ſummer approaches, leſt they might partake of the fevers that ſometimes viſit the low, ſwampy lands bordering upon that river. Wheat, it is ſaid yields better at the Yazoo than at the Natchez, owing probably to its more northern ſituation. One very conſiderable advantage will attend the ſettlers on the river Yazoo, which thoſe at the Natchez will be deprived of, without going to a great expenſe; that is, the building with ſtone, there being great plenty near the Yazoo, but none has yet been diſcovered nearer to the Natchez than the Petit Goufre, or Little Whirlpool, a diſtance of about 31 miles. Between this place and the Balize, there is not a ſtone to be ſeen any where near the river. Though the quantity of good land on the Miſſiſſippi and its branches, from the Bay of Mexico to the river Ohio, a diſtance of nearly one thouſand miles, is vaſtly great, and the conveniences attending it; ſo likewiſe we may eſteem that in the neighbourhood of the Natchez, and of the river Yazoo, the flower of it all.

About a mile and a half up the Yazoo river, on the N. ſide, there is a large creek, which communicates with the Miſſiſſippi above the river St Francis, about 100 leagues higher up, by the courſe of the river. It paſſes through ſeveral lakes by the way. At the diſtance of 12 miles from the mouth of the river Yazoo, on the S. ſide, are the Yazoo hills. There is a cliff of ſolid rock at the landing place, on which are a variety of broken pieces of ſea ſhells, and ſome entire. Four miles further up, is the place called the Ball Ground, near which a church, fort St Peter, and a French ſettlement, formerly ſtood. They were deſtroyed by the Yazoo Indians in 1729. That nation is now entirely extinct." [*Hutchins.*]

From about 20 miles eaſtward of the Miſſiſſippi, to Half way or Pearl river, the diſtance of about 60 miles, (ſome ſay leſs) is "a fine, level country, very fertile, and better watered than nearer the Miſſiſſippi. There is ſome mixture of ſand with loam, the timber the ſame, with the addition of black-jack, and poſt-oak. This tract is interſperſed with what the French call *Prairies* or *Savannas*, which are extenſive intervals of 1,000 and 2,000 acres of excellent land, of a deep black ſoil, free of all timber and trees. It is this kind of land which the Indians cultivate. From the Miſſiſſippi to this river, there are no Indians. To a tract of this country, extending along the Miſſiſſippi from the 31ſt degree of latitude to the Yazoo river, at the S. end, 30 miles wide, and narrowing as you proceed northerly to the width of 15 miles, the Indian title has been extinguiſhed. It was at firſt purchaſed by the Engliſh; but they, not having completed the payment for it, before it fell into the hands of the Spaniards, they, (the Spaniards) in the year 1792, paid the balance. At Walnut Hills, the Spaniards have a fort, which, according to treaty, is to be given up (if not already done) to the United States. To the country N. of the Yazoo, the Indian title is not yet extinguiſhed. About one half of the ſouthern part, a diſtance of about 50 miles up the Yazoo, is owned by the Chactaws, the northern half by the Chickaſaws." The gentleman who gives the above information, and who was in this country in the year 1792, ſays, "that the Yazoo is about 90 yards wide; is boatable 100 miles; that he croſſed the country by different routes, 3 or 4 times from the Miſſiſſippi to the Tombigbee; paſſed over the Yazoo ſeveral times; went up and down the river on the ſhore, and ſays that the lands to the E. of the Yazoo (the diſtance of about 100 miles) are very excellent"

Pearl river is about 40 yards wide; a branch of it paſſing E. of the Natchez and neareſt, in Coxe's map, bears the name of Buffaloe river. On the E. ſide of Pearl river, commence the Chactaw ſettlements, and extend thick to the Chickaſaw Hay river; thence, about 40 miles eaſtward, the ſettlements are ſparſe, and extend near to the Tombigbee. This is a numerous nation, containing about 3000 hunters, a peaceable and friendly people. The country inhabited by theſe Indians is noted in Coxe's map, to be "poor and barren land, covered generally with long-leafed pine." Other accounts repreſent it as much the ſame as that between the Miſſiſſippi and Pearl rivers, with the addition of ſome pine land, and better watered. The ſtreams on which the Chactaws are ſettled, as laid down on Coxe's map, are, proceeding from W. to E. the Homachitta, (called by Purcell Hoſtaphatcha) Chactaw, and Souhawtee, which unite, and the main ſtream retains the name of Homachitta till it empties into the Gulf of Mexico. This is probably the ſame river that Hutchins calls Paſcagoula. The head branches of this river ſpread extenſively through the northern part of this Territory, chiefly weſtward of the Chactaw nation. White, or Bluff river, on Coxe's map, appears to riſe in about lat. 33. N. takes a courſe to the E. of the Chactaws, and empties into the Tombigbee, ſome diſtance below the head of the tide water, and is laid down as about the ſize of Pearl river.

From the compact ſettlements of the Chactaws eaſtward to the weſtern branches of the Tombigbee, the land is tolerably good; the timber generally oak and pine, with ſome hickory, well watered and level. Of this kind is the country a diſtance of about 40 miles W. of the weſtern branches of the Tombigbee; thence to the Tombigbee, the land is more uneven, interſperſed with large ſavannas, and the whole generally good land, and pretty well watered; the water, however, has a limy taſte. The natural growth much the ſame as on the Miſſiſſippi. The intervale, or as they call it in this country, the *bottom lands*, are generally about a mile wide on the river, extremely rich, and thickly overgrown with canes. This general deſcription will apply to the whole tract belonging to the "Georgia Miſſiſſippi Company." Mr Coxe, on his map, remarks that, "On the Tombigbee and Alabama rivers there are bodies of fine rich land, but low down, towards Mobile Bay, unhealthy."

We have now arrived eaſtward to the Mobile, the principal river in this territory. "On the bar at the entrance of the bay of Mobile, there is only about 15 or 16 feet water; two-thirds of the way through the bay, towards the town of Mobile, there is from 2 to 3 fathoms; and the deepeſt water to be depended on in the upper part of the bay is only 10 or 12 feet, and in many places not ſo much. Large veſſels cannot go within 7 miles of the town." [*Hutchins.*] "This bay is about 30 miles long, and from 10 to 12 wide. The tide flows 60 or 70 miles above this bay, and is ſo far navigable for ſea veſſels. Thence 150 or 200 miles north, is good boat navigation, ſmooth water, generally 100 to 150 yards wide, and 8 to 10 feet deep." [*M. S. Minutes from Mr Perry.*] "The bay of Mobile terminates a little to the north-eaſtward of the town, in a number of marſhes and lagoons; which ſubject the people to fevers and agues, in the hot ſeaſon.(A) The river Mobile, as you aſcend it, divides into 2 principal branches, about 40 miles above the town; one of which, called the Tanſaw, falls into the eaſt part of the bay; the other empties itſelf cloſe by the town, where it has a bar of 7 feet; but there is a branch a little to the eaſtward of this, called Spaniſh river, where there is a channel of 9 or 10 feet, when the water is high; but this joins Mobile river about 2 leagues above the town. Two or three leagues above the Tanſaw branch, the Alabama river falls into Mobile river, after running from the north-eaſt a courſe of about 130 miles; that is, from Alabama fort, ſituated at the confluence of the Cooſa, and Talipooſee, both very conſiderable rivers; on which and their branches are the chief ſettlements of the Upper Creek Indians. The French fort at Alabama was evacuated 1763, and has not ſince been garriſoned. Above the confluence of Alabama and Mobile, the latter is called the Tombigbee river, from the fort of Tombigbee, ſituated on the weſt ſide of it, about 96 leagues above the town of Mobile. The ſource of this river is reckoned to be about 40 leagues higher up, in the country of the Chickaſaws. The fort of Tombigbee was taken poſſeſſion of by the Engliſh, but abandoned again in 1767, by order of the commandant of Penſacola. The river is navigable for ſloops and ſchooners about 35 leagues above the town of Mobile. The banks, where low, are partly overflowed in the rainy ſeaſons, which adds greatly to the ſoil, and adapts it particularly to the cultivation of rice. The ſides of the river are covered in many places with large canes, ſo thick that they are almoſt impenetrable; there is alſo plenty of remarkable large red and white cedar, cypreſs, elm, aſh, hickory, and various kinds of oak. Several people have ſettled on this river, who find the ſoil to anſwer beyond expectation. The lands near the mouth of the Mobile river are generally low; as you proceed upwards, the land grows higher, and may with propriety be divided into three ſtages. Firſt, low rice lands, on or near the banks of the river, of a moſt excellent quality. Secondly, what are called by the people of the country, ſecond low lands, or level flat cane lands, about 4 or 5 feet higher than the low rice lands. And, thirdly, the high upland or open country. The firſt, or low lands, extend about an half or three-quarters of a mile from the river, and may almoſt every where be eaſily drained and turned into moſt excellent rice fields, and are capable of being laid under water at almoſt all ſeaſons of the year. They are a deep black mud or ſlime, which have in a ſucceſſion of time been accumulated, or formed by the overflowing of the river. The ſecond low grounds being, in general, formed by a regular riſing of about 4 or

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(A) Mr Coxe, in his map, extends Mobile Bay ſome diſtance north of the 31ſt degree of latitude. Other accounts ſay this bay does not extend into the State of Georgia.

4 or 5 feet higher than the low lands, appear to have been originally the edge of the river. The ſecond claſs or kind of land is in general extremely rich, and covered with large timber and thick ſtrong canes, extending in width upon an average three-quarters of a mile, and in general a perfect level. It is excellent for all kinds of grain, and well calculated for the culture of indigo, hemp, flax, or tobacco. At the extremity of theſe ſecond grounds, you come to what is called the high or uplands, which is covered with pine, oak, and hickory, and other kinds of large timber. The ſoil is of a good quality, but much inferior to the ſecond or low land. It anſwers well for raiſing Indian corn, potatoes, and every thing elſe that delights in a dry ſoil. Further out in the country again, on the weſt ſide of this river, you come to a pine barren, with extenſive reed ſwamps and natural meadows or ſavannas, which afford excellent ranges for innumerable herds of cattle. On the eaſt of the river Mobile, towards the river Alabama, is one entire extended rich cane country, not inferior, perhaps, to any in America. Whenever portages are made between the Mobile and Tenneſſee river, or their branches, which are probably but a few miles apart, the Mobile will be the firſt river for commerce (the Miſſiſſippi excepted) in this part of the world, as it affords the ſhorteſt and moſt direct communication to the ſea." [*Hutchins.*]

In addition to, and confirmation of, the above account of Capt. Hutchins, ſeveral other gentlemen of intelligence who have been in this country, ſay that "the Tombigbee is navigable for ſea veſſels 60 miles into the State of Georgia;"(B) others, that "it is navigable in boats of 20 tons up to the junction of 10 and 20 Mile Creek. The Alabama and Cooſa are navigable for boats of 40 tons, as high as the big ſhoals of Cooſa river. The principal rivers which meander through this tract of country, are Seprey's and Cane Brake rivers, both which fall into the Tombigbee, and are navigable for boats as high as the 33d degree of latitude; and the Cawhawbon river, which falls into Alabama river, below the junction of Cooſa and Oakfuſkee, are boatable as far N. as the rivers laſt mentioned. The ſoil on the E. ſide of Tombigbee, is of a reddiſh caſt, producing naturally oak, hickory, and abundance of very high graſs. The country appears well calculated for the culture of wheat, corn, rye, oats, and barley. The bottoms or intervales on the rivers are not ſubject to inundations, and are exceedingly rich. The country is well watered with good wholeſome water. Further north, the country becomes uneven and ſomewhat hilly, that part particularly which divides the waters of Tombigbee from Tenneſſee river, but as you deſcend to a lower latitude, the country is more level; and down about the mouth of Cane Brake river, and thence acroſs to the Alabama, is almoſt one entire cane brake."

"The ridge which divides the Tombigbee and Alabama rivers is ſtony, and the ſoil inferior to that on the rivers; of this deſcription alſo is the country lying between the Cawhawbon and Alabama rivers; but the bottom lands on the water courſes are exceedingly rich. The country is pleaſant and healthy, being generally overgrown with high graſs, well calculated for farming, particularly for raiſing cattle. There are many extenſive and rich bottoms of cane land on the Alabama. The river which falls into the Tombigbee next above Seprey's river, has much rich land on its banks, and is boatable ſome diſtance in ſmall boats, and ſpreads into many branches, through a pleaſant, healthy, and well watered country." [*Coxe's M. S. Letter.*] As you advance eaſtward of the Alabama, in the Territory we are deſcribing, you come firſt to the Eſcambia river, and then to the Chatta Hatcha, or Pea river, which Capt. Hutchins thus deſcribes—"The river Eſcambia is the moſt conſiderable that falls into the Bay of Penſacola. The Chatta Hatcha or Pea river, which alſo heads in the Georgia Weſtern Territory, empties from the N. E. into Roſe bay, which is 30 miles long and from 4 to 6 broad. The bar at the entrance into the bay has only 7 or 8 feet water, at deepeſt; but, after croſſing the bar, has 16 or 17 feet. The mouths of the river (for almoſt all the ſouthern rivers have ſeveral mouths) are ſo ſhoal, that only a ſmall boat or canoe can paſs them. Mr Hutchins aſcended this river about 75 miles, and found that its banks very much reſembled thoſe of Eſcambia. Further eaſt are the Appalachicola, Flint, and Alabama rivers, which are deſcribed under their reſpective heads.

The northern parts of this Territory are watered by the great bend of the Tenneſſee, and its tributary ſtreams. This noble river bends ſouthward as far as latitude 34. 15. according to Capt. Hutchins' map, and divides, into nearly equal parts, the purchaſe of the *Tenneſſee Company*. North of the Tenneſſee, in this purchaſe, there is not an Indian inhabitant. From the ſouth, the Tenneſſee, in its courſe through Georgia, receives, beſides ſmaller ſtreams, the Hiwaſſee, Chiccamauga, and Occochappo or Bear Creek. Travellers ſpeak of the lands on the bend of the Tenneſſee, in terms of the higheſt commendation.

Of the Territory deſcribed above, the State of Georgia, by act of their legiſlature, paſſed Jan. 7, 1795, ſold about twenty-two millions of acres to four different companies, whoſe names and the limits of their reſpective purchaſes, as defined by the act, follow.

1. "All that tract or parcel of land including iſlands, beginning on Mobile bay, where the lat. 31. N. of the equator interſects the ſame, running thence up the ſaid bay to the mouth of the lake Tenſaw; thence up the ſaid lake Tenſaw, to the Alabama river, including Curreys and all other iſlands therein; thence up the ſaid river Alabama, to the junction of the Cooſa and Oakſuſkee rivers; thence up the Cooſa river, above the Big Shoals, to where it interſects the latitude of 34. N. of the equator; thence a due W. courſe to the Miſſiſſippi river; thence down the middle of the ſaid river, to the latitude of 32. 40.; thence a due E. courſe to the Dan or Tombigbee river; thence down the middle of the ſaid river to its junction with the Alabama river; thence down the middle of the ſaid river to Mobile Bay; thence down the ſaid Mobile Bay, to the place of beginning, ſhall be ſold unto James

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(B) Col. Hammond, late ſurveyor gen. of Georgia.

James Gunn, Matthew M'Alliſter, and George Walker, and their aſſociates, called *The Georgia Company*."

2. "All that tract of country, including iſlands, within the following boundaries, viz. beginning on the river Miſſiſſippi, at 31. 18. N. lat. thence a due E. courſe to the middle of Dan or Tombigbee river; thence up the middle of the ſaid river to N. lat. 32. 40; thence a due W. courſe along the Georgia Company line, to the river Miſſiſſippi; thence down the middle of the ſame, to the place of beginning, ſhall be ſold to Nicholas Long, Thomas Glaſſcock, Ambroſe Gordon, and Thomas Cummings, and their aſſociates, called *The Georgia Miſſiſſippi Company*."

3. "All that tract of country, including iſlands, within the following boundaries, viz. beginning at the Miſſiſſippi river, where the northern boundary line of the State ſtrikes the ſame; thence along the ſaid northern boundary line, due E. to the Tenneſſee river; thence along the ſaid Tenneſſee river, to the mouth of Bear Creek; thence up Bear Creek, to where the parallel of latitude 25 Britiſh ſtatute miles S. of the northern boundary line of the State interſects the ſame; thence along the laſt mentioned parallel of latitude, acroſs Tombigbee or Twenty Mile Creek, due W. to the Miſſiſſippi river; thence up the middle of the ſaid river, to the beginning, ſhall be ſold to John B. Scott, John C. Nightingale, and Wade Hampton, called *The Upper Miſſiſſippi Company*."

4. "All that tract of land, including iſlands, within the following boundaries, viz. beginning at the mouth of Bear Creek, on the S. ſide of Tenneſſee river; thence up the ſaid creek to the moſt ſouthern ſource thereof; thence due S. to lat. 34. 10. N. thence due E. 120 miles; thence a due N. courſe to the Great Tenneſſee river; thence up the middle of the ſaid river to the northern boundary line of the State; thence a due W. courſe along the ſaid line to where it interſects the Great Tenneſſee river, below the Muſcle Shoals; thence up the ſaid river to the place of beginning, ſhall be ſold to Zachariah Cox, Mathias Maher, and their aſſociates, called *The Tenneſſee Company*."

The ſame law enacts alſo, "that all lands lying weſtward and ſouthward of the eaſtern boundary of the ſeveral Companies' purchaſes, and not included therein, eſtimated at one-fourth of the whole lands lying weſtward and ſouthward of the eaſtern boundary of the ſaid purchaſes, and ſuppoſed to contain 7,250,000 acres, ſhall be, and the ſame is hereby declared to be reſerved and ſet apart to, and for the uſe and benefit of this State, to be granted out, or otherwiſe diſpoſed of, as future legiſlatures may direct." [*Act of Georgia Legiſlature of Jan. 7th*, 1795.]

The purchaſe-mony, amounting to 500,000 dollars, was duly paid by the reſpective Companies, into the State treaſury of Georgia, agreeably to the terms of the act. This land was ſoon after ſold by the original Companies, to various gentlemen, principally in the Middle and Eaſtern States. The ſale of this territory excited a warm and violent oppoſition in Georgia. The act authoriſing this ſale, was by certain leading men in the State, declared to be "an uſurped act,—repugnant to the principles of the Federal Conſtitution, and of the Conſtitution of Georgia—oppoſed to the good of the ſtate, and obtained by fraud, atrocious ſpeculation, corruption and colluſion." In conſequence of theſe repreſentations, a determination was formed by a powerful party, to ſet aſide and annul, at the ſucceeding ſeſſion of the legiſlature, this offenſive, "uſurped act." Efforts were accordingly made, and with ſucceſs, to obtain a legiſlature ſuited to the accompliſhment of their deſigns. Accordingly, on the 13th of Feb. 1796, an act was paſſed declaring the above-mentioned "uſurped act" null and void; and all the grants, rights and claims ariſing there-from, of no validity or effect; and that the ſaid territory was the ſole property of the State." To complete the utter annihilation of this odious act, as far as poſſible, the legiſlature ordered, that, in their preſence, and that of the public officers of the State, the ſeveral records, documents and deeds, in the ſeveral public offices, ſhould be "expunged from the faces and indexes of the books of record of the State; and the enrolled law, or uſurped act, publickly burnt." All this was accompliſhed three days after the paſſing of the act. Theſe unprecedented proceedings were attended and followed with moſt diſagreeable and tumultuary effects. The original purchaſers of theſe lands, the then holders, and all thoſe who had been intermediately concerned, who had by this time become a numerous and reſpectable body, ſcattered through the United States, were, for the moment, thrown into an unpleaſant dilemma, and for a time this buſineſs was the general topic of converſation. The title to the lands purchaſed by the above named companies, has been ſtill further embarraſſed by a claim brought forward in behalf of the United States.—*ib.*

Georgia, a townſhip in Franklin co. Vermont, contains 340 inhabitants. It is ſituated on Lake Champlain, oppoſite to the N. end of South Hero Iſland, and joins Milton on the S. and St Alban's on the north. La Moille river croſſes the extremity of the S. E. corner of this townſhip.—*ib.*

Georgia, *Southern*, a cluſter of barren iſlands, in the South Sea, and E. of the coaſt of Terra del Fuego; about lat. 54. 35. S. and long. 36. 30. W. One of them is between 50 and 60 leagues in length. —*ib.*

GEORGIUM Sidus (ſee Astronomy-*Index*, *Encycl*,) has no fewer than ſix ſatellites revolving round it, all diſcovered by Dr Herſchel. Of the two which he firſt diſcovered, one was found to revolve in 8 days 17 h. 1 m. 17 ſec. at the diſtance of 33″ from its primary; and the other in 13 d. 11 h. 5 m. 1,5 ſec. at the diſtance of 44″,23. The planes of their orbits form ſuch large angles with that of the planet itſelf, and conſequently of the ecliptic, as to be almoſt perpendicular to it. To this remarkable departure from the analogy of the old planets, another ſtill more ſingular has been lately announced. They move in a retrograde direction! The new ſatellites revolve as follows, the periodical times being inferred from their greateſt elongations: The interior ſatellite in 5 d. 21 h. 25 m. at the diſtance of 25″,5. A ſatellite intermediate between the two old ones in 10 d. 23 h. 4 m. at the diſtance of 38″,57. The neareſt exterior ſatellite at about double the diſtance of the fartheſt old one, and conſequently its periodical time 38 d. 1 h. 49 m. And the moſt diſtant ſatellite full four times as far from its primary as the old ſecond ſatellite. Whence it will take at leaſt 107 d. 16 h. 40 m. to complete its revolution. Whether the motions of theſe four be direct or retrograde, is, we ſuppoſe, not yet determined.

From ſome obſervations of the Doctor, with an excellent ſeven-feet teleſcope, certain appearances reſembling that of two rings ſurrounding the planet, and croſſing each other at right angles, were ſeen on ſeveral different days. They were not altered in poſition by turning the ſpeculum in its cell; but (ſays Mr Nicholſon) there is little doubt that they were optical deceptions, becauſe they kept their poſition with reſpect to the tube, after the relative poſition of the parallel had been much changed by the earth's rotation, and becauſe they did not appear with larger teleſcopes applied during the courſe of ten years. The diſk of the Georgium Sidus is flattened. It therefore revolves with conſiderable rapidity on its axis. From the very faint light of the ſatellites, they are obſerved to diſappear in thoſe parts of their orbits which bring them apparently neareſt the planet. This does not ariſe from an atmoſphere; for the effect is the ſame, whether the ſatellite be within or beyond the planet.

GERARD (Alexander, D. D.) was the eldeſt ſon of the reverend Gilbert Gerard miniſter of Chapel-Garioch, in the county of Aberdeen. He was born on the 22d of February, 1728, and received the firſt rudiments of his education at the pariſh ſchool of Foveran in the ſame county.

It may perhaps be proper to inform our readers, that in every pariſh in Scotland there is a ſchool where, for very ſmall fees, the youth of the pariſh are not only taught to read the Engliſh language, to write, and to perform the elementary operations of arithmetic, but are alſo inſtructed in the Greek and Latin languages. Of theſe ſchools, many of the maſters were, about ſixty years ago, eminent for claſſical learning; and it ſeems that Mr Forbes, the maſter of the ſchool of Foveran poſſeſſed ſuch fame as a teacher, that Mr Gerard judged it more expedient to commit his ſon to his care than to have him educated at the ſchool of his own pariſh, and under his own immediate inſpection. The attainments which that ſon afterwards made in literature, evince that his judgment was correct, and that the ſchoolmaſter of Foveran deſerved the fame which he enjoyed.

Young Gerard, however, did not remain long at Foveran. His father died when he was but ten years old; and his mother removing ſoon afterwards with her family to Aberdeen, he was of courſe put to the grammar-ſchool in that city; but ſo ſolid was the foundation which had been already laid, that in two years time he was deemed fit for the univerſity, and was accordingly entered a ſtudent in Mariſchal college. Such rapid progreſs ſupplies the place of that teſtimony which we have not been able to procure, reſpecting his early attachment to literature.

After completing the uſual academical courſe of four years in the ſtudy of Greek, Latin, mathematics, and philoſophy, he was admitted to the degree of maſter of arts; and immediately afterwards commenced the ſtudy of theology, which he proſecuted in the univerſities of Aberdeen and Edinburgh. In 1748, when he had little more than completed his twentieth year, he was licenced to preach in the church of Scotland, and two years afterwards was choſen aſſiſtant to Mr David Fordyce profeſſor of philoſophy in the Mariſchal college and univerſity of Aberdeen. In this capacity he performed the duties of the abſent profeſſor till the 7th of July 1752, when he was appointed ſucceſſor to Mr Fordyce who had been drowned, on the coaſt of Holland, as has been already related in the Encyclopædia.

At that period it was the practice in the Mariſchal college, as it continued to be in the King's, for the ſame profeſſor to carry forward a claſs of ſtudents for three ſucceſſive years, through all the different branches of philoſophy which were taught in the college. Theſe were, LOGIC, ONTOLOGY, PNEUMATICS, MORALS, POLITICS, and NATURAL PHILOSOPHY; and Mr Gerard carried one claſs through this extenſive courſe. MATHEMATICS and the GREEK language were taught by ſeparate profeſſors.

About the year 1754, a very material alteration was made in the *order* of teaching philoſophy in the univerſity of Aberdeen; and in the Mariſchal college each profeſſor was reſtricted to one department of ſcience. The principal and profeſſors in that college, juſtly obſerving that the public is intereſted in every thing which relates to education, thought it incumbent upon them to lay before that public the reaſons which had determined them to deviate from the arrangement which they had hitherto obſerved; and they employed profeſſor Gerard to draw up theſe reaſons. This taſk he performed in a ſmall pamphlet, which, being printed by the appointment of the college, appears to have given very general ſatisfaction.

This, indeed, it could hardly fail to do; for the judicious author points out very clearly the inconveniences of the old, and the advantages of the new plan of academical ſtudy. Having obſerved, that the philoſophy which had ſo long kept poſſeſſion of the ſchools, conſiſted, in a great meaſure, of verbal ſubtleties and theories ill-grounded, though ingeniouſly deviſed, he proceeds to contraſt it with the philoſophy of Bacon and Locke, and to ſhow of how little value the former is when compared with the latter. He then enters on a brief examination of the ſcholaſtic logic, and proves, to the conviction of every impartial judge, that the art of ſyllogizing, though a proper enough introduction to a philoſophy which was built on general principles, either taken for granted, or founded on very narrow and inadequate obſervation, is by no means fitted to aſſiſt the mind in the cultivation of that ſcience which is deduced by induction from particular facts. "The only baſis of philoſophy (ſays he) is now acknowledged to be an accurate and extenſive hiſtory of nature, exhibiting an exact view of the various phenomena, for which philoſophy is to account, and on which it is to found its reaſonings. This being the reformed ſtate of philoſophy, great inconveniences muſt be found in proſecuting the ſcholaſtic order of the ſciences. The ſtudent muſt make a tranſition at once from words and languages to philoſophy, without being previouſly introduced to the knowledge of facts, the ſole foundation of, and preparation for it; he muſt be hurried at the firſt into the moſt abſtruſe, difficult, and ſubtle parts of it; he muſt be put upon examining the nature, foundation and different kinds of evidence and reaſoning, before he is acquainted with any ſpecimens of theſe kinds by which they may be illuſtrated. And in proportion as philoſophy is more improved, and more thoroughly reformed, theſe inconveniences muſt become more ſenſible.

“ The view of theſe (continues he) induced the maſters of the Mariſchal college to think of altering the hitherto received order; and after the moſt mature deliberation, made them at laſt reſolve, that their ſtudents ſhould, after being inſtructed in languages and claſſical learning, be made acquainted with the elements of hiſtory, natural and civil, of geography and chronology, accompanied with the elements of mathematics; that they ſhould then proceed to natural philoſophy; and, laſt of all, to morals, politics, logic, and metaphyſics.”

In vindicating this arrangement, he labours with great earneſtneſs, and we think with complete ſucceſs, to ſhew the propriety of making logic the laſt branch of academical ſtudy. “ All ſciences (ſays he), all departments of knowledge whatever, muſt be premiſed as a ground-work to genuine logic. Hiſtory has one kind of evidence, mathematics another, natural philoſophy one ſtill different, the philoſophy of human nature another diſtinct from all theſe; the ſubordinate branches of theſe ſeveral parts have ſtill minuter peculiarities in the evidence appropriated to them. An unprejudiced mind will in each of theſe be convinced by that ſpecies of argument which is peculiar to it, though it does not reflect *how* it comes to be convinced. By being converſant in *them*, one is prepared for the ſtudy of *logic*; for *they* ſupply him with a fund of materials; in *them* the different kinds of evidence and argument are exemplified; from *them* only thoſe illuſtrations can be taken, without which *its* rules and precepts muſt be unintelligible.

“ All juſt concluſions concerning the works of nature muſt be founded on an induction of particulars. And as in *natural philoſophy* theſe particulars are ſupplied by obſervations and experiments on *natural bodies*; ſo in *logic*, the particulars, of which an induction muſt be made, are to be learned only from the body of *arts and ſciences*. Theſe are the ſubjects on which obſervations muſt be made, in order to lay down rules for inveſtigating and proving the truths of which they are made up; juſt as the genuine performances of any art are what muſt be conſidered and obſerved in laying down the rules of that art. No ſolid precept can be formed in logic, except by examining arts and ſciences, and attending to the method of reaſoning uſed in them, and to the evidence that accompanies it. In proportion as they are cultivated, and no farther, logic may be improved. And what is true of the invention of logic, is true likewiſe of the ſtudy of it. It can be underſtood no farther, than the ſeveral ſciences which it reviews and criticiſes are previouſly underſtood. Accordingly we find, that all the ſyſtems of logic which have not been compiled from a careful review and examination of the ſeveral ſciences, conſiſt more of ingenious ſubtleties than of uſeful precepts aſſiſting to the mind in the various parts of knowledge. And when logic has been learned before the other ſciences, the ſubſtantial parts of it have been ſcarce attended to, or made any uſe of, in the proſecution of them; nor ſo much as underſtood, but in as far as the mind was gradually opened, and brought to recollect them in its progreſs through the ſciences.

“ Logic is preciſely the ſame to *philoſophy* that works of criticiſm are to *poetry*. The rules of criticiſm are formed by an accurate ſcrutiny and examination of the beſt works of poetry. To one who had never read a poem, theſe rules would be obſcure and uſeleſs; he could not comprehend them, far leſs would he be able to form a judgment of their juſtneſs, and of the reaſons on which they are founded. If one peruſes the beſt poetical performances, he will acquire ſome degree of taſte, though he has never profeſſedly ſtudied the rules of criticiſm; and he will, at the ſame time, lay in materials, and obtain a ſtock of examples, which may render theſe rules intelligible to him, and enable him to judge whether they are juſt or not. And by afterwards ſtudying theſe rules, he improves, refines, and corrects his taſte, perceives the principles on which he has founded all his judgments, though he did not in the mean time think of them, and gains additional ſecurity againſt his judging wrong. This may illuſtrate what has been ſaid of the place which logic ought to hold among the ſciences. The obſervations made in it, both concerning the methods of invention and of probation, are founded on, and deduced from, the ſeveral ſciences in which theſe methods are uſed. Neither the obſervations themſelves, nor the reaſons on which they are built, can be fully comprehended by one abſolutely ignorant of theſe ſciences. In ſtudying the particular ſciences, reaſon will ſpontaneouſly exert itſelf: if the proper and natural method of reaſoning is uſed, the mind will, by the native force of its faculties, perceive the evidence, and be convinced by it, though it does not reflect *how* this comes to paſs, nor explicitly conſider according to what general rules the underſtanding is exerted. By afterwards ſtudying theſe rules, one will be farther fitted for proſecuting the ſeveral ſciences: the knowledge of the grounds and laws of evidence will give him the ſecurity of *reflection*, againſt employing wrong methods of proof and improper kinds of evidence, additional to that of *inſtinct* and *natural genius*. And thus logic will greatly contribute to improvement in knowledge; and more ſo, when it is uſed as a *review* of the method taken in the proſecution of ſcience, of the foundations gone upon, and of the general rules that have been obſerved, than when it is applied as an *introduction* to the elements of ſcience; for in the former caſe, its rules can be perfectly underſtood, ſufficiently illuſtrated and put in practice as they are learned, which in the latter is quite impoſſible.”

Having thus vindicated the new arrangement with reſpect to the place which it aſſigns to the ſtudy of logic, he proceeds to inquire in what order the other ſciences ſhould ſucceed each other. “ Ethics (ſays he) or moral philoſophy is founded as well as logic on pneumatics, and muſt therefore come after it. The conſtitution of man, and his ſeveral active powers, muſt be explained, before his buſineſs, his duty, and his happineſs, can be diſcovered. Juriſprudence and politics, taking a more complex view of man than morals, by conſidering his various ſtates, as well as his nature and powers, cannot, with any propriety, be introduced till morals have firſt been ſtudied.

“ It only remains then to determine whether natural philoſophy or pneumatology ought, in the order of teaching, to have the preference. And many conſiderations ſeem to require that the former ſhould be ſtudied firſt. If it were not, pneumatology would be too far disjoined from the practical ſciences founded on it; one of which, logic, ought, as we have ſeen, to be taught laſt of all. Beſides, we ought always to begin with the eaſieſt and moſt obvious ſubjects, and to proceed gradually to the moſt difficult; and in order to this, we ought to comply as much as poſſible with the natural openings and progreſs of the human mind. Now it is evident, that the mind receives firſt of all impreſſions and ideas of thoſe ſenſible things with which it is ſurrounded. It is not till after it has exerciſed its faculties about them that it reflects on its own operations, or acquires perceptions of them. We are from our earlieſt infancy accuſtomed to obſerve external things, though often tranſiently and inattentively; they lie always in our view, they force themſelves upon us, and we cannot avoid regarding them more or leſs. But we ſeldom attend to the operations of our minds in our earlier years; it is late before we acquire diſtinct notions of them, or can eaſily and readily make them the objects of our contemplation. Farther, external ſenſation, by which bodies are perceived, is a more palpable kind of evidence than internal, from which all our knowledge of ſpirits is derived; it ſtrikes and affects us more. The philoſophy of ſpirits, as well as that of bodies, is founded ſolely on experiments and obſervations; but in the latter it is much eaſier to make theſe than in the former: we can put *bodies* in any ſituation that we pleaſe, and obſerve at leiſure their effects on one another: but the phenomena of the *mind* are of a leſs conſtant nature; we muſt catch them in an inſtant, and be content to glean them up, by obſerving their effects as they accidentally diſcover themſelves in the ſeveral circumſtances of life. The reaſonings alſo by which concluſions are deduced concerning mind are of a more abſtruſe and difficult nature than thoſe employed in the ſcience of bodies; the ideas about which they are converſant are apter to be confounded with one another, and are with greater difficulty kept diſtinct. On all theſe accounts, natural philoſophy muſt be to young minds eaſier than pneumatology, and conſequently ſhould be taught firſt."

For this long digreſſion, if ſuch it ſhall be deemed, we are perſuaded that thoſe who retain any attachment to the place where their minds were firſt imbued with the principles of ſcience, will think no apology requiſite, when they are informed, that the plan of education, which is here ſo ably defended, was about the ſame period adopted by both colleges in the univerſity of Aberdeen; that the writer of this article had his own education in the King's college; and that in the proſperity of that college he ſtill feels himſelf deeply intereſted. Let it be remembered, too, that the publication from which this extract has been made, furniſhes a proof of profeſſor Gerard's abilities, and of the eſtimation in which he was held by his colleagues at a very early period of life; and then ſurely the digreſſion will not be thought impertinent.

He was now profeſſor of moral philoſophy and logic, and of theſe ſciences alone: but though his *plan of education in the Mariſchal College* ſhews the order in which his lectures were arranged, we have not been able to learn on what foundation he built his ſyſtem of ethics. As Hutcheſon's Moral Philoſophy was then much read and admired, it will not detract from Mr Gerard's merits to ſuppoſe, that, with his predeceſſor Mr Fordyce, he was an advocate for the *moral ſenſe* of that author; for there are but three or four foundations on which a ſyſtem of ethics can be raiſed; and it may be doubted whether there be one of them which is not as old as the age of Plato. It would indeed be ridiculous in any modern (A) to aim at giving a *new* foundation to moral virtue; for virtue muſt have been practiſed upon ſome ſteady principle from the earlieſt period of human ſociety; and the moſt eminent profeſſor will find ſufficient room for the diſplay of all his learning and ingenuity in illuſtrating the principle which his own judgment has led him to adopt.

Of this profeſſor Gerard was fully ſenſible; and whilſt he was conſcientiouſly diſcharging his duty to his pupils, he neglected no opportunity of improving himſelf. He was member of a literary ſociety at Aberdeen, of which the reſpectability will not be queſtioned, when it is known that it conſiſted of ſuch men as the late Doctors Blackwell, Gregory, Reid and Campbell, with Dr Beattie, and many others of perhaps equal talents, though not known to the world as authors (B). This ſociety met regularly during the winter, we believe once every fortnight; the members communicated their ſentiments with the utmoſt freedom; every novel opinion was ſure to be canvaſſed on all ſides with impartiality; the underſtandings of the members were thus mutually whetted; and hence originated Reid's *Inquiry into the Human Mind*, Gregory's *Comparative View*, Gerard's *Eſſay on Genius*, Beattie's *Eſſay on Truth*, and Campbell's *Philoſophy of Rhetoric*.

On the 5th of September 1759 Mr Gerard was ordained a miniſter of the Church of Scotland; on the 11th of June 1760, he was appointed profeſſor of divinity in the Mariſchal college, and miniſter of the Grayfriars church in Aberdeen; and at the ſame time, as we ſuppoſe, created doctor in divinity.

On the 18th of June 1771 he reſigned his Profeſſorſhip in Mariſchal college, together with his church-living, and was preferred to the theological chair in the univerſity of King's College, then become vacant by the death of profeſſor Lumiſden. In that ſtation he continued, proſecuting his ſtudies, beloved by his colleagues, and revered by his pupils, till his birth-day 1795; when, having juſt completed his 67th year, he died without a groan. His death was occaſioned by a

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(A) The friends of Mr Godwin, who affect to call his political juſtice the *new* philoſophy, will, of courſe, think this a raſh aſſertion; but were it worth while, it would be no very difficult taſk to produce, from the atheiſtical writers of ancient Greece, ſomething ſimilar even to his wildeſt paradoxes. Dr Gerard was too well acquainted with the ſubject, and too warm a friend to genuine virtue, to pretend to *novelty* in moral ſcience.

(B) Such as Profeſſor Thomas Gordon, who read lectures in the King's College for 63 or 64 years, and whoſe learning was equalled only by his virtues.

ſchirrous tumour, which began to appear on his face in the year 1794, but without confining him to the houſe, or, except for a very few weeks, interrupting his uſual purſuits. It impaired, however, his health, and gradually undermined his conſtitution. Of this he was very ſoon ſenſible; but he ſaw his diſſolution approaching with the utmoſt compoſure and reſignation, and preſerved to all about him ſo much of that equanimity and placidneſs of temper which had marked the whole courſe of his life, that of him may truly be ſaid,

> Multis illi multos annos precantibus
> Diri carcinomatis veneno contabuit,
> Nexibuſque vitæ paulatim reſolutis,
> E terris, meliora ſperans, emigravit.

Were we to hazard an opinion of Dr Gerard's intellectual powers, from having attentively peruſed his works, we would ſay that he poſſeſſed great rectitude of judgment, rather than any remarkable vigour of mind; that he was capable, by intenſe ſtudy, of becoming maſter of almoſt any ſubject, though perhaps he had not the imagination requiſite for making diſcoveries in ſcience; and that his attainments were ſolid rather than brilliant. What he knew, he knew thoroughly; but to us, his knowledge ſeems to have been the reward of labour.

By one, to whom he was well known, and who himſelf ſtands high in the republic of letters*, we are aſſured that he had improved his memory to ſuch a degree, that, in little more than an hour, he could get by heart any ſermon of ordinary length; though far from availing himſelf of this talent, as many would have done, he compoſed with care all the ſermons that he preached. In early life he made it a rule not to ſtudy after ſupper; and from that rule he never deviated, but amuſed himſelf after that time, either with the converſation of his family, or with any light reading that came in his way; and he was generally in bed by half paſt eleven. He ſeems not to have approved of early more than of late ſtudy; for though, for a few years, when as profeſſor of philoſophy he had various ſciences to teach, he roſe regularly, during winter, at five in the morning, he diſcontinued that practice as ſoon as he had it in his power, and did not enter upon ſerious ſtudy till after breakfaſt, generally about 10 o'clock. He was indeed very laborious through the day, and could with difficulty be perſuaded to take any bodily exerciſe; but being remarkably temperate in eating and drinking, he enjoyed very good health, which was only occaſionally interrupted by thoſe ſtomach complaints, to which men of ſedentary lives are often ſubject.

The fruits of this inceſſant ſtudy were, beſides the lectures which he read to his different claſſes, 1ſt, *An Eſſay on Taſte*, to which, in 1756, was adjudged the gold medal by the Philoſophical Society of Edinburgh (See Societies, *Encycl.*), which had propoſed *Taſte* as the ſubject for a prize. Of this eſſay there has been a ſecond and a third edition; of which the laſt, which was publiſhed in 1780, is conſiderably enlarged and improved. 2d, *Diſſertations on the Genius and Evidences of Chriſtianity*, publiſhed in 1766. 3d, *An Eſſay on Genius*, publiſhed in 1774. 4th, Two volumes of *Sermons*; of which the firſt was publiſhed in 1780, and the ſecond in 1782. 5th, A part of his theological courſe, entitled *The Paſtoral Care*, which was publiſhed in 1799 by his ſon Dr Gilbert Gerard, who ſucceeded him as profeſſor of divinity in the King's college and univerſity of Aberdeen. Beſides theſe works Dr Gerard publiſhed many ſingle ſermons, which were preached on occaſional ſubjects.

Of this amiable and reſpectable inſtructor of youth, we have been favoured with the following character, drawn by a man of talents and virtue†, who was firſt his pupil, and afterwards his friend; and though it made part of a funeral ſermon, we believe that, by thoſe who were moſt intimately acquainted with Dr Gerard, the panegyric which it contains will not be deemed extravagant.

"In domeſtic life, his conduct was amiable and exemplary. He poſſeſſed, in a high degree, that kindneſs of heart and affability of manner which intereſted him at all times in the happineſs of his dependants, preſerved good humour in his houſe, and endeared him to his family. He knew how to check improprieties without harſhneſs, and when and how to indulge without impairing his authority. His natural good ſenſe, ſteadineſs and prudence, prevented him from being thrown into confuſion by the adverſe incidents of life; and enabled him, in preſſing emergencies, to adopt wiſe meaſures, and to adminiſter ſalutary counſel. His tender ſympathy ſoothed the troubled hour of ſorrow; his rational and friendly advice guided his family thro' the perplexities of life, and he feelingly rejoiced in all their innocent enjoyments. His attachments were not confined to his family or his relatives; he was ſuſceptible of warm friendſhip. In ſelecting the objects of it he was cautious, always preferring thoſe whoſe merits entitled them to confidence and regard. His attachment, ſlowly formed, was not to be ſhaken by every oblique inſinuation, or by every idle report to the prejudice of his friend. Steady in his profeſſions of regard, he was capable of conſiderable and diſintereſted exertions to ſerve thoſe whom he really eſteemed. To his judicious advice they had ready acceſs; and his beſt efforts to promote their good they could always command. As a member of ſociety, his houſe was ever the ſeat of hoſpitality, and his door was always open to the ſtranger. In entertaining his friends, he equally avoided the extravagance and oſtentation which did not become his character or ſuit his fortune, and the rigid economy which marks the conduct of thoſe who give with a reluctant and a ſparing hand. He neither anxiouſly courted, nor affectedly ſhunned learned converſation. While he never obtruded upon company ſubjects which, by the diſplay of ſuperior knowledge or abilities, were calculated to gratify his own vanity at the expence of hurting others, he always ſtudied, as far as propriety would admit, to adapt his converſation to the temper and inclinations of his aſſociates. To pleaſe the young, and to promote their harmleſs feſtivity, was ever his delight; with cheerfulneſs he deſcended to their trivial amuſements, and in his preſence they felt no reſtraints but thoſe which virtue and decency impoſe. Though he often left for a little ſtudies in which he was keenly engaged, to enjoy the converſation of a friend, he never ſuffered his love of ſociety, one of his ſtrongeſt paſſions, to induce him to ſacrifice any important literary purſuit, or to neglect any neceſſary buſineſs.

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* Dr Beattie.

† *The Rev. Skene Ogilvie, Old Aberdeen.*

“ As a clergyman, the office which he held for ſeveral years in Mariſchal college rendered it his duty to be a daily preacher, and gave him a ſeat in the eccleſiaſtical courts. But the unavoidable labour of preparing prelections for his theological pupils, did not prevent his unremitting attention to his public exhibitions in the pulpit. Theſe were marked by that diſtinctneſs of arrangement, that juſtneſs of reaſoning, and that accuracy of compoſition, which effectually ſecured the approbation of the ableſt judges; while by their plainneſs and ſimplicity, they failed not of promoting the edification of the meaneſt capacities. To the low arts of acquiring popularity he never ſtooped: But his prudence, his good ſenſe, his exemplary conduct, and his miniſterial diligence, eſtabliſhed his reſpectability and uſefulneſs, and procured him the full confidence and eſteem of his colleagues. Poſſeſſing more than ordinary excellence, envy never led him to depreciate the merits of other preachers. Though one of the beſt of judges, he was always one of the moſt candid hearers. When by his tranſlation to the univerſity of King's college, he was releaſed from the labour of conſtant preaching, far from ſhewing any averſion to diſcharge the moſt public miniſterial duties, he was always obedient to preſbyterial appointments; and while health and ſtrength remained, willing to oblige his clerical friends by appearing in their pulpits. Nor in private life did he ever loſe ſight of the character of a clergyman. Having in a publication ably defended its reſpectability, in oppoſition to the ſcoffs and ſneers and ſophiſm of modern ſceptics; he conſidered it as his honour, in his life and converſation to diſplay its dignity and importance; and to ſhew that the gravity of a Chriſtian paſtor is perfectly conſiſtent with the good breeding of a gentleman, and with the cheerfulneſs, affability, and eaſe of an agreeable companion.

“ As a man of letters, his attainments were far above thoſe at which the generality of ſtudents arrive. In his literary purſuits, he had all the advantages of a judgment uncommonly clear and diſtinct, aided, from his earlieſt years, by the moſt indefatigable and perſevering ſtudy. The well-earned reputation with which, before he was promoted to the theological chair, he taught in Mariſchal college different ſciences, inconteſtibly proves that his powers, not confined to one ſubject, juſtly entitled him to eminence in ſeveral branches of literature. His publications, ſeveral of which have been tranſlated into other languages, promiſe fair to extend his fame, and to hand it down to generations yet unborn; and his unremitting labours promiſed ſtill a farther contribution to the general ſtock of learning.

“ As a profeſſor of divinity, he will be long and gratefully remembered by his numerous pupils. This was his peculiar department, and in this he ſhone. Poſſeſſing large ſtores of theological knowledge, he was judicious in ſelecting his ſubjects, happy and ſucceſsful in his manner of communicating inſtruction. He had the merit of introducing a new, and in many reſpects a better plan of theological education, than thoſe on which it had been formerly conducted. Liberal, but not looſe, in his ſentiments, his great aim was, not to impoſe by his authority upon his pupils any favourite ſyſtem of opinions; but to impreſs them with a ſenſe of the importance of the miniſterial office, to teach them the proper manner of diſcharging all its duties, and to enable them, by the knowledge of Scripture, to form a juſt and impartial judgment on controverted ſubjects. Solicitous for their improvement, he was ever ready to encourage riſing merit by his warmeſt approbation; and reluctant to damp even unſucceſsful efforts of genius by deſerved cenſure. Having a conſtant eye to what is practically uſeful, rather than to unedifying ſpeculation, he enjoined no duty which he was unwilling to exemplify in his own conduct. Hence that ſtrict regard to the miniſterial character which he uniformly diſplayed, and hence his uncommon punctuality in attending the public ordinances of religion.”

GERARDSTOWN, a neat little town, ſituated in Berkely co. Virginia, containing about 30 or 40 houſes; 10 miles from Martinſburg, and 254 from Philadelphia.—*Morſe.*

GERMAN, a townſhip in Fayette co. Pennſylvania.—*ib.*

GERMAN FLATS, the chief townſhip of Herkemer co. taken from that of Montgomery, in New-York. By the cenſus of 1790, it contained 1307 inhabitants, including 20 ſlaves; by the State cenſus of 1796, 4194 inhabitants, of whom 684 are electors. It lies on the ſouth ſide of Mohawk river, oppoſite Herkemer. It is 24 miles E. of Whiteſtown, and 60 miles weſt of Schenectady.—*ib.*

GERMANTOWN, (N. Y.) in Columbia co. containing 516 inhabitants. In 1796, it had 75 qualified voters.—*ib.*

GERMANTOWN, in Philadelphia co. Pennſylvania, is ſituated 7 miles north of Philadelphia city, and was eſteemed the ſecond town in the country, until ſeveral inland towns eclipſed it, by ſuperior eſtabliſhments and number of inhabitants. It is a corporation, conſiſting chiefly of High and Low Dutch, and contains about 250 houſes, chiefly of ſtone, ſome of which are large, elegant and commodious; built chiefly on one ſtreet, about two miles in length. The public buildings are a German Calviniſt and Lutheran church, a Friend's meeting-houſe, and an academy. Knit ſtockings, of cotton, thread and worſted, are manufactured here by individuals to a conſiderable extent, and of an excellent quality. It is an ancient town, pleaſantly ſituated, and by its vicinity to the metropolis, well adapted for manufactures. Here is the principal congregation of the Mennoniſts, and the mother of that ſect in America. They derive their name from Menno Simon, a learned man of Witmars, in Germany, one of the reformers, born in 1505. Some of his followers came into Pennſylvania, from New-York, in 1692. There are about 4000 of them in the State. They do not, like the Tunkers, believe in general ſalvation; yet, like them, they will neither ſwear nor fight, nor bear any civil office, nor go to law, nor take intereſt for money, though many break that rule. They uſe great plainneſs in their dreſs, &c. and practiſe many of the rites of the primitive Chriſtian church. This town is alſo rendered famous, by the battle fought in it, on the 4th of Oct. 1777.—*ib.*

GERMANTOWN, a poſt-town and the capital of Stokes co. N. Carolina. It is ſituated near the Town Fork of Dan river, and contains a court-houſe, gaol, and about 30 houſes. It is 528 miles S. W. by S. of Philadelphia.—*ib.*

GERMANTOWN, the chief town of Hyde co. in Newbern diſtrict, N. Carolina.—*ib.*

GERMANY, a townſhip in York co. Pennſylvania.—*ib.*

GERMINATION, among botaniſts, is a very intereſting ſubject on which the late diſcoveries in chemiſtry have thrown much light ſince the article GERMINATION was publiſhed in the *Encyclopædia.* In the year 1793, Mr Humboldt diſcovered, that ſimple metallic ſubſtances are unfavourable to the germination of plants, and that metallic oxyds favour it in proportion to their degree of oxydation. This diſcovery induced him to ſearch for a ſubſtance with which oxygen might be ſo weakly combined as to be eaſily ſeparated, and he made choice of oxygenated muriatic acid gas mixed with water. Creſſes (*lepidium ſativum*) in the oxygenated muriatic acid ſhewed germs at the end of ſix hours, and in common water at the end of 32 hours. The action of the firſt fluid on the vegetable fibres is announced by an enormous quantity of air bubbles which cover the ſeeds, a phenomenon not exhibited by water till at the end of from 30 to 45 minutes. Theſe experiments announced in Humboldt's *Flora Subterranea Fribergenſis,* and in his Aphoriſms on the chemical phyſiology of Plants, have been repeated by others (A). They were made at a temperature of from 12 to 15 Reaumur. In the ſummer of 1796, Humboldt began a new ſeries of experiments, and found that by joining the ſtimulus of caloric to that of oxygen he was enabled ſtill more to accelerate the progreſs of vegetation. He took the ſeeds of garden creſſes (*lepidium ſativum*), peas, (*piſum ſativum*), French beans (*phaſeolus vulgaris*), garden lettuce (*lactuca ſativa*), mignonette (*reſeda odorata*); equal quantities of which were thrown into pure water and the oxygenated muriatic acid at a temperature of 88° F. Creſſes exhibited germs in three hours in the oxygenated muriatic acid, while none were ſeen in water till the end of 26 hours. In the muriatic, nitric (B), or ſulphuric acid, pure or mixed with water, there was no germ at all: the oxygen ſeemed there to be too intimately united with baſes of azot or ſulphur, to be diſengaged by the affinities preſented by the fibres of the vegetable. The author announces, that his diſcoveries may one day be of great benefit in the cultivation of plants. His experiments have been repeated with great induſtry and zeal by ſeveral diſtinguiſhed philoſophers. Profeſſor Pohl at Dreſden cauſed to germinate in oxygenated muriatic acid the ſeed of a new kind of *euphorbia* taken from Bocconi's collection of dried plants, 110 or 120 years old. Jacquin and Vander Schott at Vienna threw into oxygenated muriatic acid all the old ſeeds which had been kept 20 or 30 years at the botanical garden, every attempt to produce vegetation in which had been fruitleſs, and the greater part of them were ſtimulated with ſucceſs. Even the hardeſt ſeeds yielded to this agent. Among thoſe which germinated were the yellow bonduc or nickar tree (*guilandina bonduc*), the pigeon cytiſus or pigeon pea (*cytiſus cajan*), the *dodonæa anguſtifolia*, the climbing mimoſa (*mimoſa ſcandens*), and new kinds of the *homæa.*—There are now ſhewn at Vienna very valuable plants which are entirely owing to the oxygenated muriatic acid, and which are at preſent from five to eight inches in height. Humboldt cauſed to germinate the *cluſia roſea*, the ſeeds of which had been brought from the Bahama iſlands by Booſe, and which before had reſiſted every effort to make them vegetate. For this purpoſe he employed a new proceſs, which ſeems likely to be much eaſier for gardeners who have not an opportunity of procuring oxygenated muriatic acid: He formed a paſte by mixing the ſeeds with the black oxyd of manganeſe, and then poured over it the muriatic acid diluted with water. Three cubic inches of water were mixed with half a cubic inch of the muriatic acid. The veſſel which contains this mixture muſt be covered, but not cloſely ſhut; elſe it might readily burſt. At the temperature of 95° the muriatic acid becomes ſtrongly oxydated; the oxygenated muriatic gas which is diſengaged paſſes through the ſeeds; and it is during this paſſage that irritation of the vegetable fibres takes place.—*Philoſophical Magazine.*

GERRY, a townſhip in Worceſter co. Maſſachuſetts. It was incorporated in 1786, and contains 14,000 acres of land, on which are 740 inhabitants. It is 30 miles N. W. of Worceſter, and 65 N. W. by W. of Boſton. —*Morſe.*

GESCHE EL AUBE, or GIR GIR, a ſpecies of graſs growing plentifully near *Ras el Feel* on the borders of Abyſſinia. It begins, ſays Mr Bruce, to ſhoot in the end of April, when it firſt feels the humidity of the air. It advances then ſpeedily to its full height, which is about 3 feet 4 inches. It is ripe in the beginning of May, and decays, if not deſtroyed by fire, very ſoon afterwards.

The leaf is long, pointed, narrow, and of a feeble texture. The ſtock from which it ſhoots produces leaves in great abundance, which ſoon turn yellow and fall to the ground. The goats, the only cattle theſe miſerable people have, are very fond of it, and for it abandon all other food while it is within their reach. On the leaves of ſome plants our author ſaw a very ſmall glutinous juice, like to what we ſee upon the leaves of the lime or the plane, but in much leſs quantity; this is of the taſte of ſugar.

From the root of the branch ariſes a number of ſtalks, ſometimes two, but never, as far as he had ſeen, more than three. The flower and ſeed are defended by a wonderful perfection and quantity of ſmall parts. The head when in its maturity is of a purpliſh brown. This

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(A) See Uſlar's Fragments of Phytology, Plenck's Phyſiology, Villdenow's Dendrology, and *Dictionaire de Phyſique* par Gehler.

(B) The nitric acid, however, diluted with a great deal of water, accelerates germination alſo, according to the experiments of Candolle, a young naturaliſt, who has applied with great ſucceſs to vegetable phyſiology. This phenomena is the more intereſting, as chemiſtry affords other analogies of the oxygenated muriatic acid and the nitric acid. Profeſſor Pfaſs at Kiel, by purſuing Humboldt's experiments, has found that frogs ſuffocated in oxygenated muriatic acid gas increaſe in irritability, while thoſe which periſh in carbonic acid gas are leſs ſenſible of galvaniſm.

This ſpecies of graſs was one of the acquiſitions of our author's travels. It was not before known in Europe, nor when he publiſhed his book had the ſeed produced a plant any where but in the garden of the French king.

GETTYSBURGH, a ſmall town in York co. Pennſylvania, ſituated at the head of Rock Creek, one of the head waters of the Monococy, and contains about 30 houſes. It is 9 miles north of the Maryland line, 8 miles from Millerſtown, 15 from Abbotſtown, 36 from Williamſport in Maryland, and 118 W. by S. of Philadelphia.—*Morse.*

GHEYSSIQUAS, a nation of Hottentots which inhabits a diſtrict of South Africa bordering on the country of Caffraria. M. Vaillant viſited a horde of this people at no great diſtance from Orange river, as he was returning from his laſt African excurſion to the Cape, and was ſhewn by them a chain of mountains to the eaſt, which extending to a diſtance was loſt in the north, and which, inhabited by their principal tribes, ſeparated them from the Caffres, or at leaſt from the Briquas and Bremas, whom they conſider as tribes of Caffres.

With reſpect to ſuch characteriſtics as are not original and derived from nature, as the form of their dreſs, weapons, inſtruments of muſic, fondneſs for hunting and dancing and the like, the Gheyſſiquas do not differ from the ſurrounding nations, except in having adopted a particular colour for their ornaments. All the ornaments of the Gheyſſiquas are white, and compoſed of the bones of a ſheep's leg or foot, to which they give a dazzling whiteneſs by proceſſes peculiar to themſelves. Thus, as they fabricate their own necklaces and other articles of luxury, and have no occaſion to purchaſe the materials, they have no dependance on the colonies with reſpect to trade, except for a few neceſſary articles which they want in common with other ſavages. Accordingly this nation is leſs known and leſs viſited than any other.

The women are well made, lively, and always ready to laugh or dance: yet, with all the gaiety of their diſpoſition, they have the reſervedneſs of manners to which poliſhed nations give the names of modeſty and decorum, and which, in ſo warm a climate and with ſuch ardent conſtitutions, appears to be a virtue of no eaſy attainment.

Our author ſays that he no where met with a nation ſo truly generous. Though he had nothing to give in exchange, yet during two days that he ſtaid with them, he had bowls of milk brought to him as preſents, night and morning, from every hut. The chief even obliged him to accept a lamb; and though our traveller's attendants were not deſtitute of proviſions, he would give them alſo ſeveral ſheep with which to regale themſelves; a degree of generoſity of which a proper eſtimate can be formed only by thoſe who know ſomething of ſavage manners and ſavage penury.

The practice of ſemi-caſtration prevails among the Gheyſſiquas, and among them only of all the Hottentot tribes; and it prevails in all their hordes without exception. Our author convinced himſelf of this fact by his own eyes; for the men were ſo complaiſant, that, if he had choſen, he might have inſpected the whole horde. Many travellers have written upon the ſubject of this whimſical operation; but they do not agree either as to its origin, the motives that lead to its invention, or the nations by whom it is practiſed. Kolben, who ſays that it commonly conſiſts in the extraction of the left teſticle, repreſents it as a religious ceremony, a general and ſacred law, with all the Hottentots indiſcriminately; but this is unqueſtionably falſe. (See HOTTENTOTS, *Encycl.*) Others attribute it to the deſire of the Gheyſſiquas to render themſelves more fleet in running, an effect which it ſurely is not calculated to produce; and ſome have ſaid that its intention is to prevent the too abundant propagation of the ſpecies. Yet Kolben, though he ſeems inclined to this laſt opinion, affirms, that twins are not the leſs common on account of the operation. According to thoſe whom M. Vaillant queſtioned on the ſubject, it is merely a mark of diſtinction which their anceſtors, being at war with the neighbouring nations, invented for the purpoſe of knowing one another; but, as he himſelf admits, this is a very improbable account of the matter, as they would ſurely have adopted, like the Loangoes, Pomboes, and Cormantins, marks of diſtinction more eaſily diſcerned. Be this as it may, the operation among the Gheyſſiquas is performed by the father, commonly at the birth of the child, though ſometimes not till he has completed his third year.

GHIRGONG, the capital of *Aſam* in Hindoſtan is, according to Mr Pennant, ſituated in latitude 26° 30′ north. He does not ſtate its longitude. It has four gates, and the city is encompaſſed with a bound hedge of bamboos. The Rajah's palace is ſurrounded by a cauſey, planted on each ſide with a cloſe hedge of bamboos, which ſerves inſtead of a wall. On the outſide there is a ditch, which is always full of water. The Rajah's ſeat is adorned with lattice work and carving. Within and without have been placed plates of braſs, ſo well poliſhed, that when the rays of the ſun ſtrike upon them they ſhine like mirrors. It is an aſcertained fact, that 3000 carpenters and 12,000 labourers were conſtantly employed in this work during two years before it was finiſhed.

Pennant's View of Hindoſtan.

The Aſiatic Reſearches ſpeak much of the wealth of Aſam, and of the plenty and excellency of its natural productions, and that it abounds in all metals but tin. Gold is found in every part of the country by waſhing the ſand of the rivers, and is one of the ſources of revenue; 12,000, ſome ſay 20,000 people, are employed in that work, each of whom has from the Rajah a certain wages. Its gum lac is excellent, and it is very productive of ſilk.

Among the fruits which this country produces are mangoes, plantains, jacks, oranges, citrons, limes, pine apples, and puniala, a ſpecies of tamarind, which has ſuch an excellent flavour, that every perſon who taſtes it prefers it to the plum. There are alſo cocoa-nut trees, pepper vines, and the areca trees. The ſugar cane excels in ſoftneſs and ſweetneſs, and is of three colours, red, black and white. There is ginger free from fibres, and betel vines. The ſtrength of vegetation and fertility of the ſoil are ſuch, that whatever ſeed is ſown or ſlips planted they always thrive. The environs of Ghirgong furniſh ſmall apricots, yams, and pomegranates; but as theſe articles are wild, and not aſſiſted by cultivation and engraftment, they are very indifferent. The principal crop in this country conſiſts in rice and lentiles. Wheat and barley are never ſown; lignum aloes is alſo a production of this country. The ſilks are excellent, and reſemble thoſe of China, but they manufacture very few more than are required for uſe. They are ſucceſsful in embroidering with flowers and in weaving velvet.—One of their great foreſts is inhabited by abundance of elephants: 6 or 700 may be taken in a year, but they are neglected by the natives, who have neither horſes, camels nor aſſes, ſuch as are brought from other countries.

According to our author, "the people of Aſam are a baſe unprincipled nation, and have no fixed religion. They follow no rule but that of their own inclination, and make their own vicious minds the teſt of the propriety of their actions. They do not adopt any mode of worſhip practiſed either by heathens or Mahomedans, nor do they concur with any of the known ſects which prevail among mankind; unlike the pagans of Hindoſtan, they do not reject victuals which have been dreſſed by Moſlems, and they abſtain from no fleſh except human. They even eat animals that have died a natural death."

On this paſſage, one of the ableſt of our literary journaliſts obſerves, that in juſtice to the people of Aſam, we muſt remark, that the above account, extracted from the memoirs of Mir Jumla's expedition into that country, was compoſed by a rigid Mahomedan, at the court of that fanatical tyrant Aurengzebe. The author and his maſter ſaw, in the Aſameſe, only idolaters; and, in idolaters, the meaneſt of mankind. Their diet, though leſs reſtricted than that of the Hindoos of Bengal, is by no means promiſcuous; and their religion does not in any way differ from that of Hindoſtan, as might eaſily be proved by their coins, inſcribed with the names of Hindoo deities.

GIBBON (Edward Eſq.), the celebrated hiſtorian of the Decline and Fall of the Roman Empire, was born at Putney in the county of Surry on the 27th of April 1737. He was the firſt child of the marriage of Edward Gibbon, Eſq; and Judith Porten, the youngeſt daughter of a merchant of London.

The family of Gibbon appears to be ancient and honourable; and our author delights to trace his pedigree from John Gibbon architect to King Edward III. who poſſeſſed lands in the hundred and pariſh of Rolvenden, in the diſtrict which is now called the *Weald* of Kent. In that diſtrict the elder branch of the family ſtill adheres to its native ſoil, without much increaſe or diminution of property; but the fortunes of the younger branch, from which ſprung the ſubject of this memoir, were fluctuating. It is not, however, with his family, but with himſelf, that we are concerned.

So feeble was his conſtitution, and ſo precarious his life during his childiſh years, that at the baptiſm of each of his brothers (and they were five in number) his father's prudence ſucceſſively repeated the name of Edward, that, in caſe of the death of the eldeſt ſon, this patronymic appellation might ſtill be perpetuated in the family. His brothers and a ſiſter were all ſnatched away in their infancy; and, in terms of affectionate gratitude, he attributes his own preſervation to the more than maternal care of a maiden aunt, his mother's eldeſt ſiſter. "Many anxious and ſolitary days (ſays he) did that dear and excellent woman conſume in the patient trial of every mode of relief and amuſement. Many wakeful nights did ſhe ſit by my bed ſide in trembling expectation that each hour would be my laſt. Suffice it to ſay, that while every practitioner from Sloane and Ward to the Chevalier Taylor was ſucceſſively ſummoned to torture or relieve me, the care of my mind was too frequently neglected for that of my health. Compaſſion always ſuggeſted an excuſe for the indulgence of the maſter, or the idleneſs of the pupil; and the chain of my education was broken as often as I was called from the ſchool of learning to the bed of ſickneſs."

His education ſeems indeed to have been far from ſyſtematical. At the age of ſeven he was delivered into the hands of Mr John Kirkby, who exerciſed about eighteen months the office of his domeſtic tutor, and of whom he writes in terms of reſpect. This man had been an indigent curate in Cumberland, and when forced by diſtreſs to leave his native country, he was introduced by his learning and his virtue to the family of Mr Gibbon, from whom he might have found at leaſt a temporary ſhelter, had not an act of indiſcretion again driven him into the world. One day reading prayers in the pariſh church, he moſt unluckily forgot the name of King George; and his patron, a loyal ſubject, diſmiſſed him with ſome reluctance and a decent reward. As our author deſcribes his anceſtors as hereditary Tories, and ſome of them as Jacobites, we think it not improbable that Mr Kirkby may have been accuſtomed to omit the name of the King when reading prayers in the family; for otherwiſe he would have pronounced it mechanically in the church.

Be this as it may, our author, upon the diſmiſſion of his tutor, was ſent to Kingſton upon Thames, to a ſchool of ſeventy boys kept by Dr Woodeſon and his aſſiſtants. He does not repreſent himſelf either as happy or as having made great progreſs at that ſchool. The want of ſtrength and activity diſqualified him for the ſports of the field; his companions reviled him for the ſins of his Tory anceſtors; and his ſtudies were frequently interrupted by ſickneſs. After a real or nominal reſidence of near two years at Kingſton, he was finally recalled (Dec. 1747) by the death of his mother. By this time he was well acquainted with Pope's Homer, the Arabian Nights Entertainments, Dryden's Virgil, and a tranſlation of Ovid's Metamorphoſes; and the entertainment which he received from theſe books gave him a taſte for deſultory reading.

After living a year with his maternal aunt, during which period he read many books on religious ſubjects too deep for the comprehenſion of a boy, he was in January 1749 entered in Weſtminſter ſchool, of which Dr John Nicoll was at that time head maſter. "There (ſays he) in the ſpace of two years, interrupted by danger and debility, I painfully climbed into the third form; and my riper age was left to acquire the beauties of the Latin, and the rudiments of the Greek tongue. Inſtead of audaciouſly mingling in the ſports, the quarrels, and the connections of our little world, I was ſtill cheriſhed at home under the maternal wing of my aunt, who now lived in College-ſtreet; and my removal from Weſtminſter long preceded the approach of manhood."

He was firſt carried to Bath for the recovery of his health; then to Wincheſter, where he lived in the houſe of a phyſician, then to Bath again, where he read with a clergyman ſome odes of Horace and ſome epiſodes of Virgil; after which an unſucceſsful trial was made to renew his attendance at Weſtminſter ſchool. "It might now be apprehended (ſays he) that I ſhould continue for life an illiterate cripple; but as I approached my ſixteenth year, nature diſplayed in my favour her myſterious energies: my conſtitution was fortified and fixed; and my diſorders, inſtead of growing with my growth, and ſtrengthening with my ſtrength, moſt wonderfully vaniſhed. In conſequence of this he was carried to Oxford; and before he had accompliſhed his fifteenth year, was, on April 3, 1752, matriculated a gentleman commoner of Magdalen college.

For the honour of that celebrated univerſity, we would fain hope that the account which Mr Gibbon gives of Magdalen college is greatly exaggerated. He repreſents his tutors as wholly regardleſs of his morals or his ſtudies. Speaking of the firſt and beſt of them, for he had two, he ſays, "No plan of ſtudy was recommended for my uſe; no exerciſes were preſcribed for his inſpection; and, at the moſt precious ſeaſon of youth, whole days and weeks were ſuffered to elapſe without labour or amuſement, without advice or account." We ſhall make no other remark on this paſſage than that from gentlemen, who muſt have been contemporary with Mr Gibbon at Magdalen, we have received different accounts of the college; and it is ſurely a very ſingular circumſtance, that at this period of idleneſs, our author ſhould have become enamoured of Sir John Marſham's *Canon Chronicus*, and have conceived the idea of writing an *Eſſay on the age of Seſoſtris*. Such, however, was the caſe. Not only was the eſſay planned, but part of it was written; and though he never finiſhed it, he declares, that his ſolution of ſome difficulties in chronology was not devoid of ingenuity; but he goes on to vilify Oxford. "It might at leaſt be expected (ſays he), that an eccleſiaſtical ſchool ſhould inculcate the orthodox principles of religion. But our venerable mother had contrived to unite the oppoſite extremes of bigotry and indifference: an heretic, or unbeliever, was a monſter in her eyes; but ſhe was *always*, or *often*, or *ſometimes* (A), remiſs in the ſpiritual education of her own children. Without a ſingle lecture, either public or private, either Chriſtian or Proteſtant, without any academical ſubſcription, without any Epiſcopal confirmation, I was left by the dim light of my catechiſm to grope my way to the chapel and communion table, where I was admitted, without a queſtion, how far, or by what means, I might be qualified to receive the ſacrament. Such almoſt incredible neglect was productive of the worſt miſchiefs. From my childhood I had been fond of religious diſputation; nor had the elaſtic ſpring been totally broken by the weight of the atmoſphere of Oxford. The blind activity of idleneſs urged me to advance without armour into the dangerous mazes of controverſy; and, at the age of ſixteen, I bewildered myſelf in the errors of the church of Rome."

Thus anxious is our author to account for his reconciliation to the Romiſh church by the negligence of the tutors of his college. This event took place on the 8th of June 1753, when, at the feet of a prieſt in London, he ſolemnly, though privately, abjured the errors of hereſy. An elaborate controverſial epiſtle, approved by his director, and addreſſed to his father, announced and juſtified the ſtep he had taken; and the old gentleman, in the firſt ſally of paſſion, divulging the ſecret, the gates of Magdalen college were ſhut againſt the convert. It was neceſſary therefore to form a new plan of education; and our young Catholic, by the advice of Mr Elliot (afterwards Lord Elliot), was ſettled, on the 30th of June, under the roof and tuition of Mr Pavilliard, a Calviniſt miniſter at Lauſanne in Switzerland.

He repreſents his ſituation there as at firſt extremely uncomfortable. He could not avoid contraſting a ſmall chamber, ill contrived and ill furniſhed, with his elegant apartment in Magdalen college; and M. Pavilliard being entruſted with the management of his expences, he felt himſelf degraded from the rank of gentleman commoner to that of a ſchool-boy. He began, however, gradually to be reconciled to his fate; and his love of reading returned, which, he ſays, had been chilled by the air of Oxford. He rapidly acquired the French language; and of his tutor, he ſays, "My obligations to the leſſons of Mr Pavilliard gratitude will not ſuffer me to forget. He was endued with a clear head and a warm heart; his innate benevolence had aſſuaged the ſpirit of the church; he was rational, becauſe he was moderate: in the courſe of his ſtudies he had acquired a juſt though ſuperficial knowledge of moſt branches of literature; by long practice he was ſkilled in the arts of teaching; and he laboured with aſſiduous patience to know the character, gain the affection, and open the mind of his Engliſh pupil."

Under the tuition of this amiable preceptor he deſcribes his progreſs in the French and Latin claſſics, in hiſtory, geography, logic and metaphyſics, as uncommonly rapid; and he allows to the ſame man a handſome ſhare of the honour of reclaiming him from the errors of popery. The various diſcriminating articles of the Romiſh creed diſappeared like a dream; and after a full conviction, on Chriſtmas day 1754, he received the ſacrament in the church of Lauſanne. Thus had our author communicated with three different ſocieties of Chriſtians before the completion of his eighteenth year; and as ſuch changes from church to church are always dangerous, we need not wonder, that, in a mind ſo ill furniſhed as Mr Gibbon's then was for theological inveſtigations, they paved the way for his laſt change to Deiſm. At preſent, however, he ſuſpended his religious inquiries, acquieſcing (as he ſays) with implicit belief in the tenets and myſteries which are adopted by the general conſent of Catholics and Proteſtants.

He continued to proſecute his ſtudies with ardour. Under Mr Pavilliard he learned the Greek alphabet, the grammar, and the pronunciation of the language according to the French accent, and ſoon made himſelf maſter of the works of Homer, Herodotus, and Xenophon. During two winters he attended the private lectures of M. de Traytorrens, who explained the elements of algebra and geometry as far as the conic ſections of the Marquis de l'Hôpital; but in mathematics he was content (he ſays) to receive the paſſive impreſſion of his profeſſor's lectures, without any active exerciſe of his own powers. In the writings of Grotius and Puffendorf he ſtudied the duties of a man, the rights of a citizen,

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(A) Surely *always* and *ſometimes* are words of very different import: why are they uſed then, in this ſentence as ſynonymous?

tizen, the theory of juſtice, and the laws of peace and war, which have had ſome influence on the practice of modern Europe. "Locke's treatiſe on government, (ſays he) inſtructed me in whig principles, which are founded rather in reaſon than experience; but my delight was in the frequent peruſal of Monteſquieu, whoſe energy of ſtyle and boldneſs of hypotheſis were powerful to awaken and ſtimulate the genius of the age."

We have been thus minute in our account of Mr Gibbon's ſtudies, becauſe it furniſhes perhaps the moſt uſeful leſſon which can be drawn from the whole hiſtory of his life. His education had been rendered irregular, and had been often interrupted by ill-health and a feeble conſtitution; but as ſoon as he was able, and had an opportunity, he applied with ardour to the cultivation of letters, and his works bear witneſs that his labour was crowned with ſucceſs. "This part of his ſtory therefore (to uſe the words of Johnſon) well deſerves to be remembered. It may afford uſeful admonition and powerful encouragement to men whoſe abilities have been made, for a time, uſeleſs, and who, having loſt one part of life in idleneſs, are tempted to throw away the remainder in deſpair."

In the year 1757 Voltaire arrived at Lauſanne, and our young ſtudent's deſire to ſee the man who was at once a poet, an hiſtorian, and, as he deemed himſelf, the prince of philoſophers, was ardent, and eaſily gratified. He was received by the vain and arrogant Frenchman with civility as an Engliſh youth, but could not boaſt of any peculiar notice or diſtinction. "The higheſt gratification (ſays he) which I received from Voltaire's reſidence at Lauſanne, was the uncommon circumſtance of hearing a great poet declaim his own productions on the ſtage. His declamation was faſhioned to the pomp and cadence of the old ſtage; and he expreſſed the enthuſiaſm of poetry rather than the feelings of Nature."

About this time Mr Gibbon became enamoured of Mademoiſelle Suſan Curchod, the daughter of the miniſter of Craſſy, in the mountains which ſeparate the Pays de Vaud from the county of Burgundy. In terms of rapture he deſcribes this lady as poſſeſſed of every accompliſhment which could adorn her ſex. She liſtened to the voice of truth and paſſion; her parents honourably encouraged the connection; and our author indulged in the dream of felicity: but on his return to England, he diſcovered that his father would not hear of this ſtrange connection, and that without his conſent he was deſtitute and helpleſs. "After a painful ſtruggle (ſays he) I yielded to my fate. I ſighed as a lover, I obeyed as a ſon, and my wound was inſenſibly healed by time, abſence, and the habits of a new life." The lady conſoled herſelf by giving her hand to M. Neckar, then a rich banker of Paris, afterwards the miniſter, and at laſt one of the deſtroyers of the French monarchy.

In the ſpring of the year 1758 our author was recalled to England. On his arrival in London he haſtened to the houſe of his aunt, Mrs Porten, who had been the guardian of his tender years; for though his father was in town awaiting his arrival, he knew not how he ſhould be received by a parent who had parted with him in anger, and given him a ſtepmother in his abſence. His reception was more agreeable than he expected. His father received him as a man and a friend; and the manners of Mrs Gibbon were ſuch, that, after ſome reſerve on his ſide, ſhe and he eaſily adopted the tender names and genuine characters of mother and ſon; and, by the indulgence of theſe parents, he was left at liberty to conſult his own taſte or reaſon in the choice of place, of company, and of amuſements. In London he had few acquaintances, and hardly any friends; and being accuſtomed to a very ſmall ſociety at Lauſanne, he preferred the retirement of the country to the buſtle of that over-grown metropolis, where he found hardly any entertainment but in the theatres.

Before he left Lauſanne he had begun a work on the ſtudy of ancient literature, which was ſuggeſted by the deſire of juſtifying and praiſing the object of a favourite purſuit. "In France (ſays he), to which my ideas were confined, the learning and language of Greece and Rome were neglected by a philoſophic age. The guardian of thoſe ſtudies, the Academy of Inſcriptions, was degraded to the loweſt rank among the three royal ſocieties of Paris: the new appellation of *Erudits* was contemptuouſly applied to the ſucceſſors of Lipſius and Caſaubon; and I was provoked to hear*, that the exerciſe of the memory, their ſole merit, had been ſuperſeded by the nobler faculties of the imagination and the judgment. I was ambitious of proving by my own example, as well as by my precepts, that all the faculties of the mind may be exerciſed and diſplayed by the ſtudy of ancient literature." This laudable ambition continued; and in his father's houſe at Beriton in Hampſhire he finiſhed his *Eſſai ſur l'Etude de la Literature;* which, after being reviſed by Mallet the poet and Dr Maty of the Britiſh muſeum, was, in 1761, publiſhed in a ſmall 12mo volume.

The ſubjects of taſte, criticiſm, and philoſophy, which in this work came under our young author's conſideration, could hardly promiſe much novelty of remark. Some former obſervations, however, he appears to have placed in a new and pleaſing point of view; advancing, moreover, ſome ingenious conjectures, and diſplaying no inconſiderable erudition. Yet, by his own account, he was at this time almoſt a ſtranger to the writers of Greece; and when he quotes them, it is probable that the quotations are given at ſecond hand. To this eſſay was prefixed a dedication to his father in the Engliſh language, which exhibits the author himſelf in a very amiable light; but if his reputation had depended ſolely upon this youthful attempt, the name of Gibbon would have been loſt in oblivion. Yet he ſeems, even in his riper years, to have been delighted with it himſelf, and to have conſidered its merits as equal to thoſe of his later productions; but Milton, it is ſaid, preferred the Paradiſe Regained to the Paradiſe Loſt.

Before the publication of this eſſay, the author, at his own deſire, had been appointed a captain in the South-Hampſhire militia, in which he ſerved upwards of two years. At firſt, the company of ruſtic and illiterate officers, and the buſtle of a military life were extremely diſagreeable to him, as they interrupted his ſtudies; but he admits, that his military ſervices, his bloodleſs and inglorious campaigns, as he calls them, were, on the whole, beneficial, as they brought him acquainted with Engliſh manners, Engliſh parties, and Engliſh principles, to which his foreign education and reſerved temper had hitherto kept him an entire ſtranger. In the camp and in quarters he had even found leiſure, after the firſt ſeven or eight months of his ſervice, to read a great deal of

* See *Le Diſcours Preliminaire par D'Alembert à l'Encyclopedie.*

Greek, and to plan different hiſtorical works, to the compoſition of which he ſeems to have thought that he was born with an innate propenſity. He always talks of himſelf as a philoſopher; but ſurely a more unphiloſophical perſuaſion than this has ſeldom been admitted.

At the end of the war he went again abroad, and reached Paris on the 28th of January 1763, only 36 days after the diſbanding of the militia, in which he had borne the commiſſion of a captain. In that metropolis he ſtaid not long. He viſited palaces, churches, gardens, and theatres, and was introduced to D'Alembert and Diderot, then conſidered as at the head of French ſcience. From Paris he proceeded to Switzerland, and once more took up his reſidence at his favourite Lauſanne. Voltaire's impieties had forced him from that town to his own caſtle at Ferney, where our author once viſited him, without (he ſays) courting his more intimate acquaintance.

The ſociety in which Mr Gibbon moſt delighted during his ſecond reſidence at Lauſanne was a very ſingular one. "It conſiſted of fifteen or twenty unmarried ladies of genteel families; the eldeſt perhaps about twenty, all agreeable, ſeveral handſome, and two or three of exquiſite beauty. At each other's houſes they aſſembled almoſt every day, without the controul, or even the preſence of a mother or an aunt; they were truſted to their own prudence, among a crowd of young men of every nation in Europe. They laughed, they ſung, they danced, they played at cards, they acted comedies; but in the midſt of this careleſs gaiety, they reſpected themſelves, and were reſpected by the men; the inviſible line between liberty and licentiouſneſs was never tranſgreſſed by a geſture, a word or a look, and their virgin chaſtity was never ſullied by the breath of ſcandal or ſuſpicion."

We readily agree with our author that this ſingular inſtitution was expreſſive of the innocent ſimplicity of Swiſs manners; and we only regret that he had not the ſame reſpect for the ladies of his own country as for thoſe frolic females of Switzerland. He would not, in that caſe, have ſtained ſome of his moſt brilliant pages with obſcene ribaldry.

We ſhall not follow him in his ramble through Italy, or repeat his remarks on the towns which he viſited. It is ſufficient, in ſuch a ſketch as this, to inform our readers, that it was at Rome on the 15th of October 1764, as he ſat muſing amidſt the ruins of the Capitol, that the idea of his great work firſt ſtarted into his mind. But his original plan was circumſcribed to the decay of the city rather than of the empire.

From carrying even this contracted plan into execution he was for ſome years diverted. On the 25th of June 1765 he arrived from Italy at his father's houſe in Hampſhire, and found that he had filial duties to perform which interrupted his ſtudies and diſturbed his quiet. His father had involved himſelf in difficulties, from which he could be extricated only by ſelling or mortgaging part of his eſtate; and to ſuch ſale or mortgage our author cheerfully conſented. He regrets on this occaſion that he had not "embraced the lucrative purſuits of the law or of trade, the chances of civil office or India adventure, or even the fat ſlumbers of the church;" and it is to be hoped that, when he thought even of *ſlumbering* in the church, he had ſtill ſome faith in revealed religion. He waſted ſome time in planning a hiſtory of the revolutions of Switzerland, and even wrote part of it in the French language, which, by the advice of friends, he however ſuppreſſed. We next find him engaged with a friend in a journal entitled *Memoires Literaires de la Grand Bretagne*, of which two volumes for the years 1767 and 1768 were publiſhed, and a third almoſt completed, when his friend, a native of Switzerland, was engaged, through his intereſt, as travelling governor to Sir Richard Worſley, and the Journal was of courſe, abandoned. He then entered the liſts with Warburton; whoſe interpretation of the ſixth book of the Æneid he attacked with great petulance and with much ſucceſs. The biſhop of Gloceſter was by this time in a ſtate of great mental decay, which was peculiarly unfortunate for our author; for had his Lordſhip enjoyed his priſtine vigour, he would probably have given Mr Gibbon ſuch a chaſtiſement as might have made him more modeſt afterwards when writing the hiſtory of the Decline and Fall of the Roman Empire.

To that great work he now ſat down ſeriouſly; and the hiſtory which he gives of his preparatory ſtudies ſufficiently accounts for the inaccuracy of his quotations. Through the darkneſs of the middle ages he explored his way in the annals and antiquities of Italy by the learned Muratori and other moderns; and ſeems to acknowledge that, from the beginning to the end of his work, he frequently contented himſelf with authorities furniſhed at ſecond hand.

At laſt, in 1776, the firſt volume of his hiſtory was publiſhed by Cadell the bookſeller and Strahan the printer; and the ſucceſs of it far ſurpaſſed his expectation. The encomiums laviſhed on it by Dr Robertſon and Mr Hume in letters to the author, and the fulſome compliments which thoſe three eminent hiſtorians paid to each other, are melancholy ſpecimens of lettered littleneſs and vanity. The ſecond and third volumes appeared in 1781; the fourth, fifth and ſixth in 1787; and Mr Gibbon's fame was eſtabliſhed as a hiſtorian. The work was admired both by natives and by foreigners, and tranſlated into ſeveral of the languages of Europe. Dr Zimmerman repreſents the author as excelling perhaps Hume and Robertſon, who were hiſtorians of the firſt rank. "All the dignity (he adds), all the charms of hiſtoric ſtyle, are united in Gibbon: his periods are melody itſelf, and all his thoughts have nerve and vigour." This praiſe, however, muſt not be admitted without exception. Few writers, indeed, were poſſeſſed of ſuch popular talents as our hiſtorian. The acuteneſs of his penetration, and the fertility of his genius, have been ſeldom equalled, and ſcarcely ever ſurpaſſed. He ſeizes, with ſingular felicity, on all the moſt intereſting facts and ſituations, and theſe he embelliſhes with the utmoſt luxuriance of fancy and elegance of ſtyle. His periods are full and harmonious; his language is always well choſen, and is frequently diſtinguiſhed by a new and peculiarly happy adaptation. His epithets, too, are in general beautiful and happy; but he is rather too fond of them. The uniform ſtatelineſs of his diction ſometimes imparts to his narrative a degree of obſcurity, unleſs he deſcends to the miſerable expedient of a note, to explain the minuter circumſtances. His ſtyle, on the whole, is much too artificial; and this gives a degree of monotony to his periods, Gibbon.

Gibbon.

which extends, we had almoſt ſaid, to the turn of his thoughts.

A more ſerious objection is his attack upon Chriſtianity; the looſe and diſreſpectful manner in which he mentions many points of morality regarded as important on the principles of natural religion; and the indecent alluſions and expreſſions which too often occur in the work.

An attack upon Chriſtianity is not cenſurable merely as ſuch; it may proceed from the pureſt and moſt virtuous motives: but, in that caſe, the attack will never be carried on in an inſidious manner, and with improper weapons; and Chriſtianity itſelf, ſo far from dreading, will invite every mode of fair and candid diſcuſſion. Our hiſtorian, it muſt be confeſſed, often makes, when he cannot readily find, an opportunity to inſult the Chriſtian religion. Such, indeed, is his eagerneſs in the cauſe, that he ſtoops to the moſt deſpicable pun, or to the moſt awkward perverſion of language, for the pleaſure of turning the ſcripture into ribaldry, or calling Jeſus an impoſtor.

Yet of the Chriſtian religion has Mr Gibbon himſelf obſerved, that it "contains a pure, benevolent, and univerſal ſyſtem of ethics, adapted to every duty and every condition of life." Such an acknowledgment, and from ſuch a writer, too, ought to have due weight with a certain claſs of readers, and of authors likewiſe, and lead them ſeriouſly to conſider, how far it is conſiſtent with the character of good citizens to endeavour, by ſly inſinuations, oblique hints, indecent ſneer, and profane ridicule, to weaken the influence of ſo *pure* and *benevolent* a ſyſtem as that of Chriſtianity, acknowledged to be admirably calculated for promoting the happineſs of individuals, and the welfare of ſociety.

Mr Hayley, in his poetical Eſſay on Hiſtory, after a ſplendid panegyric on the arduous labours of his friend, laments the irreligious ſpirit by which he was actuated.

> Think not my verſe means blindly to engage
> In raſh defence of thy profaner page!
> Though keen her ſpirit, her attachment fond,
> Baſe ſervice cannot ſuit with Friendſhip's bond;
> Too firm from Duty's ſacred path to turn,
> She breathes an honeſt ſigh of deep concern,
> And pities Genius, when his wild career
> Gives Faith a wound, or Innocence a tear.
> Humility herſelf divinely mild,
> Sublime religion's meek and modeſt child,
> Like the dumb ſon of Crœſus, in the ſtrife,
> Where force aſſail'd his father's ſacred life,
> Breaks ſilence, and with filial duty warm,
> Bids thee revere her parent's hallow'd form (B)!

The part of the hiſtory which gave ſuch offence to his own friend, as well as to the friends of the Chriſtian religion in general, was the account which our hiſtorian has given of the progreſs and eſtabliſhment of Chriſtianity in the two laſt chapters of his firſt volume; in which he endeavours to prove, that the wonderful triumph of that religion over all the eſtabliſhed religions of the earth, was not owing to any miraculous atteſtations to its truth, but to five ſecondary cauſes which he enumerates: and that Chriſtianity, of courſe, could not be of divine origin. Several anſwers appeared on this occaſion, written, as we may naturally ſuppoſe, with different degrees of temper and ability (C).

One of them only, Mr Davis, who had undertaken to point out various inſtances of miſrepreſentation, inaccuracy, and even plagiariſm, in his account, did our hiſtorian condeſcend particularly to anſwer, and that in a tone of proud contempt and confident ſuperiority. To this Mr Davis replied; and it is but juſtice to obſerve, that his reply bears evident marks of learning, judgment, and critical acumen; and that he has convicted our author of ſometimes quoting inaccurately to ſerve a purpoſe. At his other anſwerers Mr Gibbon merely glanced, treating Dr Watſon, however, with particular reſpect; but his poſthumous memoirs ſhew how much he felt the attacks made on him by Lord Hailes, Dr White, of Oxford, and Mr Taylor. To Dr Prieſtley, who, in his *Hiſtory of the Corruptions of Chriſtianity*, threw down his gauntlets at once to Biſhop Hurd and the hiſtorian of the Roman empire, and who preſented the latter with a copy of his book, declaring, at the ſame time, that he ſent it not as a gift but as a *challenge*; he wrote in ſuch terms as produced a correſpondence, which certainly added not to the honour of the diſſenting divine.

At the beginning of the memorable conteſt between Great Britain and America, our author was returned, by the intereſt of Mr Eliot (now Lord Eliot), for the borough of Liſkeard, and ſupported with many a ſincere and ſilent vote, the rights, though not, perhaps, the intereſt, of the mother country. "After a fleeting illuſive hope, prudence condemned me (ſays he) to acquieſce in the humble ſtation of a mute. I was not armed by Nature and education with the intrepid energy of mind and voice.

> *Vincentem ſtrepitus, et natum rebus agendis.*

Timidity was fortified by pride; and even the ſucceſs of my pen diſcouraged the trial of my voice."

That pen, however, was uſeful to the miniſtry whom he could not ſupport by his eloquence in the houſe. At the requeſt of the Lord Chancellor and Viſcount Weymouth, then ſecretary of ſtate, he vindicated, in a very able manner, againſt the French manifeſto, the juſtice of the Britiſh arms, and his *Memoire Juſtificatif*, was delivered as a ſtate paper to the courts of Europe. He was rewarded for this ſervice with the place of one of the lords commiſſioners of trade and plantations; and kept it, till the board was aboliſhed by Mr Burke's reform bill. For accepting this place he was ſeverely, but moſt unjuſtly, blamed by ſome of the leaders of the oppoſition,

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(B) Herodotus relates, that a Perſian ſoldier, at the ſtorming of Sardis, was preparing to kill Crœſus, whoſe perſon he did not know, and who, giving up all as loſt, neglected to defend his own life. A ſon of the unfortunate monarch, who had been dumb from his infancy, and who never ſpoke afterward, found utterance in that trying moment, and preſerved his father by exclaiming, 'O kill not Crœſus!'

(C) Dr Chelſum, Dr Randolph, Dr Watſon (biſhop of Llandaff) Lord Hailes, Dr White, Mr Apthorp, Mr Davis, and Mr Taylor, the author of 'The Letters of Ben Mordecai.'

oppoſition, as if he had deſerted a party in which he had never enliſted, and to the principles of which he was rendered inimical both by family prepoſſeſſion and by his own judgment.

On the downfal of Lord North's adminiſtration, Mr Gibbon was of courſe in the oppoſition deprived of an office, without the ſalary of which he could not conveniently ſupport the expence of living in London. The coalition was indeed ſoon formed, and his friends were again in power; but having nothing to give him immediately, they could not detain him in parliament or even in England. He was tired of the buſtle of the metropolis, and ſighed once more for the retirement of Lauſanne, at which he arrived before the overthrow of the coalition miniſtry, and where he lived happily till the laſt years of his life. It was in this retreat that he wrote the fourth, fifth, and ſixth volumes of his hiſtory; and he left it only for a year to ſuperintend the publication of theſe volumes in London. This great work being concluded, he returned to the banks of the Leman lake, but found his enjoyments damped by the diſtreſs and ſoon afterwards by the death of his oldeſt and deareſt Swiſs friend. Lauſanne had now loſt much of its attraction; the French revolution had crowded it with unfortunate emigrants, who could not be cheerful themſelves or excite the cheerfulneſs of others; and the demons of democracy had begun to poiſon the minds of the ſober citizens with principles which Mr Gibbon had always held in abhorrence. Speaking of theſe principles and their effects in Switzerland, he adds, "I beg leave to ſubſcribe my aſſent to Mr Burke's creed on the revolution of France. I admire his eloquence, I approve his politics, I adore his chivalry, and I can almoſt excuſe his reverence for church eſtabliſhments. While the ariſtocracy of Berne protects the *happineſs*, it is ſuperfluous to enquire whether it be founded in the *rights* of men: the economy of the ſtate is liberally ſupplied without the aid of taxes: and the magiſtrates *muſt* reign with prudence and equity, ſince they are unarmed in the midſt of an armed nation."

It was againſt the beneficent and mild government of Berne that the emiſſaries of France contrived to excite the diſcontents of the people, by inſtilling into their ſimple and untutored minds their own wild notions of liberty and equality. From the effects of this Gallic phrenzy, which began to be very viſible ſo early as the beginning of the year 1792, Mr Gibbon reſolved to take ſhelter in England, and to abandon, for ſome time at leaſt, what he called his paradiſe at Lauſanne. Difficulties intervened, and forced him to poſtpone his journey from week to week, and from month to month; but on receiving the accounts of Lady Sheffield's death, he haſtened to adminiſter conſolation to his friend, and arrived ſafe in London in the beginning of June 1793.

He continued in good health and ſpirits through the whole of the ſummer; but his conſtitution had ſuffered much from repeated attacks of the gout, and from an incipient dropſy in his ancles. The ſwelling of his ancles, however, ſubſided; but it was only in conſequence of the water flowing to another place; and being repeatedly tapped for a *hydrocele*, he at laſt ſunk under it, and died at his lodgings in St James's ſtreet, London, on the 16th of January, 1794.

To draw a character at once general and juſt of this extraordinary man, would be difficult perhaps to one who had enjoyed the pleaſure of his acquaintance, and muſt be impoſſible to thoſe to whom his perſon was a ſtranger. Of the extent of his erudition there can be but one opinion; but various opinions may be held reſpecting the accuracy of his knowledge. Lord Sheffield, who knew him well, and loved him much, aſſures us, that his converſation was ſtill more captivating than his writings: but this could not reſult from the brilliancy of his wit; for of wit he declares himſelf that he had none. His memory was capacious and retentive, his penetration uncommon, and his colloquial eloquence ready and elegant; ſo that he could illuſtrate almoſt any topic of converſation from the copious ſtores of his own mind. From his private correſpondence, and a journal not written for the public eye, he appears to have been a dutiful ſon, a loyal ſubject, and an affectionate and ſteady friend; but it is difficult to reconcile with ſo much moral and political worth his unfair and unmanly ſneers at the religion of his country.

GIBRALTAR is a fortreſs of immenſe ſtrength, of which a very full account has been given in the *Encyclopædia*. Nothing, however, is in that article ſaid of the natural hiſtory of the mountain on which the fortreſs is built, though, to men of ſcience, that ſubject muſt be as intereſting as a detail of ſieges. This defect we are enabled to ſupply by means of Major Imrie's mineralogical deſcription of Gibraltar, which is publiſhed in the fourth volume of the Tranſactions of the Royal Society of Edinburgh; and, we are perſuaded, the following abſtract of that elegant memoir will afford rational entertainment to many of our readers.

"The form of this mountain is oblong; its ſummit a ſharp craggy ridge; its direction is nearly from north to ſouth; and its greateſt length, in that direction, falls very little ſhort of three miles. Its breadth varies with the indentations of the ſhore, but it no where exceeds three quarters of a mile. The line of its ridge is undulated, and the two extremes are ſomewhat higher than its centre.

"The ſummit of the Sugar Loaf, which is the point of its greateſt elevation towards the ſouth, is 1439 feet; the Rock Mortar, which is the higheſt point to the north, is 1350; and the Signal Houſe, which is nearly the central point between theſe two, is 1276 feet above the level of the ſea. The weſtern ſide of the mountain is a ſeries of rugged ſlopes, interſperſed with abrupt precipices. Its northern extremity is perfectly perpendicular, except towards the north-weſt, where what are called the Lines intervene, and a narrow paſſage of flat ground that leads to the iſthmus, and is entirely covered with fortification. The eaſtern ſide of the mountain moſtly conſiſts of a range of precipices; but a bank of ſand riſing from the Mediterranean in a rapid acclivity, covers a third of its perpendicular height. Its ſouthern extremity falls, in a rapid ſlope from the ſummit of the Sugar Loaf, into a rocky flat of conſiderable extent, called Windmill Hill.

"The principal maſs of the mountain rock conſiſts of a grey, denſe (what is generally called primary) marble; the different beds of which are to be examined in a face of 1350 feet of perpendicular height, which it preſents to Spain in a conical form. Theſe beds, or ſtrata, are of various thickneſs, from 20 to upwards of 40 feet, dipping in a direction from eaſt to weſt, nearly at an angle of 35 degrees. In ſome parts of the ſolid maſs of this rock are found teſtaceous bodies entirely tranſmuted into the conſtituent matter of the rock, and their interior hollows filled up with calcareous ſpar; but theſe do not occur often in its compoſition, and its beds are not ſeparated by any intermediate ſtrata.

"The caves of Gibraltar are many, and ſome of them of great extent. That which moſt deſerves attention and examination is called St Michael's Cave, which is ſituated upon the ſouthern part of the mountain, almoſt equally diſtant from the Signal Tower and the Sugar Loaf. Its entrance is 1000 feet above the level of the ſea: This entrance is formed by a rapid ſlope of earth, which has fallen into it at various periods, and which leads to a ſpacious hall, incruſted with ſpar, and apparently ſupported in the centre by a large maſſy ſtalactitical pillar. To this ſucceeds a long ſeries of caves of difficult acceſs. In theſe cavernous receſſes, the formation and proceſs of ſtalactites is to be traced, from the flimſy quilt-like cone, ſuſpended from the roof, to the robuſt trunk of a pillar, three feet in diameter, which riſes from the floor, and ſeems intended by Nature to ſupport the roof from which it originated.

"The only inhabitants of theſe caves are bats, ſome of which are of a large ſize. The ſoil, in general, upon the mountain of Gibraltar is but thinly ſown; and in many parts that thin covering has been waſhed off by the heavy autumnal rains, which have left the ſuperficies of the rock, for a conſiderable extent, bare and open to inſpection. In thoſe ſituations, an obſerving eye may trace the effects of the ſlow, but conſtant, decompoſition of the rock, cauſed by its expoſure to the air, and the corroſion of ſea ſalts, which, in the heavy gales of eaſterly winds, are depoſited with the ſpray on every part of the mountain. Thoſe uncovered parts of the mountain rock alſo expoſe to the eye a phenomenon worthy of ſome attention, as it tends clearly to demonſtrate, that, however high the ſurface of this rock may now be elevated above the level of the ſea, it has once been the bed of agitated waters. This phenomenon is to be obſerved in many parts of the rock, and is conſtantly found in the beds of torrents. It conſiſts of pot-like holes, of various ſizes, hollowed out of the ſolid rock, and formed apparently by the attrition of gravel or pebbles, ſet in motion by the rapidity of rivers or currents in the ſea.

"Upon the weſt ſide of the mountain, towards its baſe, ſome ſtrata occur, which are heterogenial to the mountain rock: the firſt, or higheſt, forms the ſegment of a circle; its convex ſide is towards the mountain, and it ſlopes alſo in that direction. This ſtratum conſiſts of a number of thin beds; the outward one, being the thinneſt, is in a ſtate of decompoſition, and is mouldering down into a blackiſh brown or ferruginous coloured earth. The beds, inferior to this, progreſſively increaſe in breadth to 17 inches, where the ſtratification reſts upon a rock of an argillaceous nature.

"This laſt bed, which is 17 inches thick, conſiſts of quartz of a blackiſh blue colour, in the ſepta or cracks of which are found fine quartz cryſtals, colourleſs, and perfectly tranſparent. Theſe cryſtals are compoſed of 18 planes, diſpoſed in hexangular columns, terminated at both extremities by hexangular pyramids. The largeſt of thoſe that Major Imrie ſaw did not exceed one-fourth of an inch in length: They, in general, adhere to the rock by the ſides of the column, but are detached without difficulty. Their great degree of tranſparency has obtained them the name of *Gibraltar diamonds*."

Much has been ſaid of the foſſil bones found in the rock of Gibraltar; and the general idea which exiſts concerning them is, that they are found in a petrified ſtate, and incloſed in the ſolid calcareous rock; but this, ſays Major Imrie, is a miſtake, which could ariſe only from inaccurate obſervation and falſe deſcription.

"In the perpendicular fiſſures of the rock, and in ſome of the caverns of the mountain (all of which afford evident proofs of their former communication with the ſurface), a calcareous concretion is found, of a reddiſh brown ferruginous colour, with an earthy fracture, and conſiderable induration, incloſing the bones of various animals, ſome of which have the appearance of being human. Theſe bones are of various ſizes, and lie in all directions, intermixed with ſhells of ſnails, fragments of the calcareous rock, and particles of ſpar; all of which materials are ſtill to be ſeen in their natural uncombined ſtates, partially ſcattered over the ſurface of the mountain. Theſe having been ſwept, by heavy rains at different periods, from the ſurface into the ſituations above deſcribed, and having remained for a long ſeries of years in thoſe places of reſt, expoſed to the permeating action of water, have become inveloped in, and cemented by, the calcareous matter which it depoſits.

"The bones, in this compoſition, have not the ſmalleſt appearance of being petrified: and if they have undergone any change, it is more like that of calcination than that of petrifaction, as the moſt ſolid parts of them generally admit of being cut and ſcraped down with the ſame eaſe as chalk.

"Bones combined in ſuch concretions are not peculiar to Gibraltar: they are found in ſuch large quantities in the country of Dalmatia, and upon its coaſts in the iſlands of Cherſo and Oſero, that ſome naturaliſts have been induced to go ſo far as to aſſert, that there has been a regular ſtratum of ſuch matter in that country, and that its preſent broken and interrupted appearance has been cauſed by earthquakes, or other convulſions, experienced in that part of the globe. But, of late years, a traveller (Abbé Alberto Fortis) has given a minute deſcription of the concretion in which the bones are found in that country: And by his account it appears, that with regard to ſituation, compoſition, and colour, it is perfectly ſimilar to that found at Gibraltar. By his deſcription, it alſo appears that the two mountain rocks of Gibraltar and Dalmatia conſiſt of the ſame ſpecies of calcareous ſtone; from which it is to be preſumed, that the concretions in both have been formed in the ſame manner and about the ſame periods.

"Perhaps if the fiſſures and caves of the rock of Dalmatia were ſtill more minutely examined, their former communications with the ſurface might yet be traced, as in thoſe deſcribed above; and, in that caſe, there would be at leaſt a ſtrong probability, that the materials of the concretions of that country have been brought together by the ſame accidental cauſe which has probably collected thoſe found in the caverns of Gibraltar. Major Imrie traced, in Gibraltar, this concretion, from the loweſt part of a deep perpendicular fiſſure, up to the ſurface of the mountain. As it approached to the ſurface, the concretion became leſs firmly combined, and, when it had no covering of the calcareous rock, a ſmall degree of adheſion only remained, which was evidently produced by the argillaceous earth, in its compoſition, having been moiſtened by rain and baked by the ſun.

“ The depth at which theſe materials had been penetrated by that proportion of ſtalactitical matter, capable of giving to the concretion its greateſt adheſion and ſolidity, he found to vary according to its ſituation, and to the quantity of matter to be combined. In fiſſures, narrow and contracted, he found the concretion poſſeſſing a great degree of hardneſs at ſix feet from the ſurface; but in other ſituations more extended, and where a larger quantity of the materials had been accumulated, he found it had not gained its greateſt degree of adheſion at double that depth. In one of the caves, where the maſs of concretion is of conſiderable ſize, he perceived it to be divided into different beds, each bed being covered with a cruſt of the ſtalactitical ſpar, from one inch to an inch and a half in thickneſs, which ſeems to indicate, that the materials have been carried in at various periods, and that thoſe periods have been very remote from each other.

“ At Roſia Bay, upon the weſt ſide of Gibraltar, this concretion is found in what has evidently been a cavern, originally formed by huge unſhapely maſſes of the rock which have tumbled in together. The fiſſure, or cavern, formed by the diſruption and ſubſidence of thoſe maſſes, has been entirely filled up with the concretion, and is now expoſed to full view by the outward maſs having dropped down in conſequence of the encroachments of the ſea. It is to this ſpot that ſtrangers are generally led to examine the phenomenon; and the compoſition, having here attained to its greateſt degree of hardneſs and ſolidity, the haſty obſerver ſeeing the bones incloſed in what has ſo little the appearance of having been a vacuity, examines no further, but immediately adopts the idea of their being incaſed in the ſolid rock. The communication from this former chaſm, to the ſurface from which it has received the materials of the concretion is ſtill to be traced in the face of the rock, but its opening is at preſent covered by the baſe of the line wall of the garriſon. Here bones are found that are apparently human; and thoſe of them that appear to be of the legs, arms, and vertebræ of the back, are ſcattered among others of various kinds and ſizes, even down to the ſmalleſt bones of ſmall birds. Major Imrie found here the complete jaw-bone of a ſheep; it contained its full complement of teeth, the enamel of which was perfect, and its whiteneſs and luſtre in no degree impaired. In the hollow parts of ſome of the large bones was contained a minute cryſtallization of pure and colourleſs calcareous ſpar; but, in moſt, the interior part conſiſted of a ſpary cruſt of a reddiſh colour, ſcarcely in any degree tranſparent.

“At the northern extremity of the mountain, the concretion is generally found in perpendicular fiſſures. The miners there, employed upon the fortifications in excavating one of thoſe fiſſures, found, at a great depth from the ſurface, two ſkulls, which were ſuppoſed to be human; but, to the Major, one of them, if not both, appeared to be too ſmall for the human ſpecies. The bone of each was perfectly firm and ſolid; from which it is to be preſumed, that they were in a ſtate of maturity before they were incloſed in the concretion. Had they appertained to very young children, perhaps the bone would have been more porous and of a leſs firm texture. The probability is, that they belonged to a ſpecies of monkey, which ſtill continues to inhabit, in conſiderable numbers, thoſe parts of the rock which are to us inacceſſible.

“ This concretion varies, in its compoſition, according to the ſituation in which it is found. At the extremity of Princes Lines, high in the rock which looks towards Spain, it is found to conſiſt only of a reddiſh calcareous earth, and the bones of ſmall birds cemented thereby. The rock around this ſpot is inhabited by a number of hawks, that, in the breeding ſeaſon neſtle here and rear their young; the bones in this concretion are probably the remains of the food of thoſe birds. At the baſe of the rock below King’s Lines, the concretion conſiſts of pebbles of the prevailing calcareous rock. In this concretion, at a very conſiderable depth under the ſurface, was found the under parts of a glaſs bottle, uncommonly ſhaped, and of great thickneſs; the colour of the glaſs was of a dark green.”

Major Imrie makes an apology for giving ſo minute a deſcription of theſe foſſil bones; but, in our opinion, the public is indebted to him for beſtowing ſo much attention on a ſubject which all muſt admit to be curious, and which, from the ſtrange inferences drawn from ſimilar phenomena by modern philoſophers, has become important as well as curious.

We cannot diſmiſs this article without noticing the ſubterraneous galleries conſtructed in the rock not only for the protection of the men during a ſiege, but alſo for placing cannon, to annoy the enemy, in ſituations inacceſſible but by ſuch means. The idea of forming theſe galleries was conceived by the late Lord Heathfield when governor, and by him in ſome meaſure, carried into execution; though the plan was not completed till lately by General O’Hara. Of theſe galleries we have in the *Monthly Magazine* for April 1798 an animated account, which we ſhall inſert in the writer’s own words.

“ The ſubterraneous galleries are very extenſive, pierce the rock in ſeveral places and in various directions, and at various degrees of elevation; all of them have a communication with each other, either by flights of ſteps cut in the rock, or by wooden ſtairs where the paſſages are required to be very perpendicular.

“ The centinels may now be relieved during a ſiege from one poſt to another in perfect ſafety; whereas, previouſly to the conſtructing of theſe galleries, a vaſt number of men were killed by the Spaniards while marching to their ſeveral ſtations. The width of theſe galleries is about twelve feet, their height about fourteen. The rock is broken through in various places, both for the purpoſe of giving light and for placing the guns to bear on the enemy. In different parts there are ſpacious receſſes, capable of accommodating a conſiderable number of men. To theſe receſſes they give names, ſuch as St Patrick’s Chamber, St George’s Hall, &c. The whole of theſe ſingular ſtructures have been formed out of the ſolid rock by blaſting with gunpowder. Through the politeneſs of an officer on duty, a place called Smart’s Reſervoir was opened for our inſpection, which is a great curioſity, and not generally permitted to be ſhewn. It is a ſpring at a conſiderable depth in the body of the rock, and is above 700 feet above the level of the ſea; we deſcended into the cavern that contains it by a rope ladder, and with the aid of lighted candles proceeded through a narrow paſſage over cryſtallized protuberances of the rock till we came to a hollow, which appears to have been opened by ſome convulſion of Nature. Here, from a bed of gems, ariſes the ſalutary ſount, clear as the brilliant of the eaſt, and cold as the iſicle. We hailed the nymph of the grot, and, proſtrating ourſelves, quaffed hygean nectar from her ſparry urn. When reſtored to the light of day, we obtained, through the medium of the ſame gentleman, the key of St George's Hall, at which we arrived by a very intricate and gloomy path to the ſpacious excavation, which is upwards of an hundred feet in length, its height nearly the ſame. It is formed in a ſemicircular part of the rock; ſpacious apertures are broken through, where cannons of a very large calibre command the iſthmus, the Spaniſh lines, and a great part of the bay. The top of the rock is pierced through, ſo as to introduce ſufficient light to enable you to view every part of it. It appears almoſt incredible that ſo large an excavation could be formed by gunpowder, without blowing up the whole of that part of the rock, and ſtill more ſo, that they ſhould be able to direct the operations of ſuch an inſtrument, ſo as to render it ſubſervient to the purpoſe of elegance. We found in the hall a table, placed, I ſuppoſe, for the conveniency of thoſe who are traverſing the rock. The cloth was ſpread, the wine went round, and we made the vaulted roof reſound with the accents of mirth and the ſongs of conviviality."

Theſe excavations are indeed very extraordinary works; but as the whole rock abounds with caverns, we wiſh that our author had inquired more particularly than he ſeems to have done, whether St George's Hall be wholly the work of art. From one of the paſſages which we have extracted from Major Imrie's memoir, we are led to think that it is not, or, at leaſt, that the concretion removed had not acquired the conſiſtence of the more ſolid parts of the rock. If this was the caſe, much of the wonder will vaniſh ſince the pick-axe and chiſel were probably employed to give elegance to the vault, and even, in ſome degree, to direct the operation of the gunpowder.

GIBRALTER, an ancient town in the province of Venezuela, in Terra Firma. It is ſituated on the ſouth-eaſtern ſide of Maracaibo Lake. The country in its vicinity is well watered with rivers, and bears the beſt quality of cacao, and very large cedars. The beſt Spaniſh tobacco is made here, called Tabago de Maracaibo, from which the valuable ſnuff is made, vulgarly called *Mackaba* ſnuff. The air, however, is ſo unhealthy, that very few but labourers live in the town; the wealthier ſort reſorting to Merida or Maracaibo. —*Morse.*

GILL, a new townſhip in Hampſhire co. Maſſachuſetts, on the weſt bank of Connecticut river, a little below the mouth of Miller's river, on the oppoſite ſide, and named after his Honor, Moſes Gill, Lieutenant-Governor of Maſſachuſetts.—*ib.*

GILLORI, an iſland on the coaſt of Weſt-Florida, is divided from Dauphin Iſland by a narrow channel, through which a boat may paſs with ſome difficulty; and between Gillori and the main land, on the weſt ſide of Mobile Bay, there is a chain of ſmall iſlands, and oyſter ſhells, through which is a paſſage of 4 feet called Paſſe au Heron.—*ib.*

GILMANTOWN, a townſhip in Strafford co. New-Hampſhire, ſouth-weſterly of Lake Winnipiſeogee, and 52 miles N. W. of Portſmouth. It was incorporated in 1727, and contained 775 inhabitants in 1775; and in 1790, 2613.—*ib.*

GIMBOLS, are the braſs rings by which a ſea compaſs is ſuſpended in its box that uſually ſtands in the binacle.

GIRT, in timber-meaſuring, is the circumference of a tree, though ſome uſe this word for the quarter of 4th part of the circumference only, on account of the great uſe that is made of it; for the ſquare of this 4th part is eſteemed and uſed as equal to the area of the ſection of the tree; which ſquare therefore multiplied by the length of the tree, is accounted the ſolid content. This content, however, is always about one-fourth part leſs than the true quantity; being nearly equal to what this will be after the tree is hewed ſquare in the uſual way: ſo that it ſeems intended to make an allowance for the ſquaring of the tree.

Girt-*Line*, is a line on the common or carpenter's ſliding rule, employed in caſting up the contents of trees by means of their girt.

GIRTY'*s Town*, an Indian village in the N. W. Territory, near the head of the navigable water or landing on St Mary's river, where the Indians ceded at the treaty of Greenville, a tract of 2 miles ſquare to the United States.—*Morse.*

GLADE *Road*, at Bonnets' tavern, 4 miles from Bedford, on the road from Philadelphia to Pittſburg Forks; the ſouthernmoſt is called the Glade Road; the northernmoſt the *Old*, or *Forbes's Road*, and goes by Ligonier. Theſe roads unite 28 miles from Pittſburg. In the *Glades*, a tract of country at the entrance of the Alleghany Mountains, they cannot raiſe corn, as the earth is ſubjected to froſt from Sept. to June. —*ib.*

GLADY *Creek*, a ſmall ſtream which flows through the eaſt bank of Little Miami river in the N. W. Territory.—*ib.*

GLAIZE, *Au*, a S. S. W. branch of the Miami of the Lake, which interlocks with St Mary's river. By the treaty at Greenville, the Indians have ceded to the United States a tract of land 6 miles ſquare, at the head of its navigable waters, and 6 miles ſquare at its confluence with the Miami, where Fort Defiance now ſtands.—*ib.*

GLASGOW, a new county in Newbern diſtrict, N. Carolina, taken from Dobbs' co. It is bounded N. by Edgcomb, S. by Lenoir, E. by Pitt, and W. by Wayne.—*ib.*

GLASS Etching, or *Engraving upon*, is in the article Chemistry *(Encycl.)* ſaid to be a new art; and as that acid which diſſolves ſiliceous earth, and alſo glaſs, was firſt diſcovered in the year 1771 by Scheele, one might naturally imagine that the art of etching with it upon glaſs could not be older. By many others, as well as by us, it has indeed been noticed as a new invention; yet Profeſſor Beckmann, whoſe laborious reſearches have brought many things to light, has proved, that ſo early as the year 1670 the art of etching upon glaſs was diſcovered by Henry Schwanhard, ſon of George Schwanhard, who was a celebrated glaſs-cutter, patronized by the Emperor Ferdinand III. about the middle of the laſt century. At the time of his death, 1667, the father practiſed his art at Prague and Ratiſbon. Whether the ſon followed the ſame buſineſs at the ſame towns, or removed to Nuremberg, is not very evident from the profeſſor's hiſtory; but in the year above-mentioned, ſome *aqua regia* (*nitro-muriatic acid*) having accidentally fallen on his ſpectacles, he was ſurpriſed to find the glaſs corroded by it, and become quite ſoft. He thus found himſelf in poſſeſſion of a liquid by which he could etch writing and figures upon plates of glaſs.

Such is our information; but if it be admitted (and it would diſplay unreaſonable ſcepticiſm to queſtion it), Schwanhard muſt either have improved the nitro-muriatic acid by ſome means or other unknown to us, or have confined his etchings to ſome particular kinds of glaſs; for the *fluoric* is the only acid, with which we are acquainted, that corrodes all glaſs. (See Chemistry-*Index* in this *Supplement*). M. Beckmann indeed ſeems to think that he had diſcovered the fluoric acid itſelf; for in the year 1725 there appeared in a periodical work the following receipt for making a powerful acid, by which figures of every kind can be etched upon glaſs.

"When the *ſpiritus nitri per diſtillationem* has paſſed into the recipient, ply it with a ſtrong fire, and when well dephlegmated, pour it, as it corrodes ordinary glaſs, into a Weldenburg flaſk. Then throw into it a pulveriſed green Bohemian emerald, otherwiſe called *heſphorus* (which, when reduced to powder, and heated, emits in the dark a green light), and place it in warm ſand for 24 hours. Take a piece of glaſs well cleaned, and freed from all greaſe by means of a ley; put a border of wax round it, about an inch in height, and cover it all over with the above acid. The longer you let it ſtand ſo much the better; and at the end of ſome time the glaſs will be corroded, and the figures which have been traced out with ſulphur and varniſh will appear as if raiſed above the pane of glaſs."

That the Bohemian emerald or *heſphorus* mentioned in this receipt is green ſparry fluor, cannot, ſays the profeſſor, be doubted; and he ſeems to have as little doubt of the receipt itſelf having paſſed from Schwanhard and his ſcholars to the periodical work of 1725, from which it has been lately inſerted in the Œkonomiſche Encyclopedie of Krunitz. This ſuppoſition certainly acquires a conſiderable degree of probability from the ſimilarity of Schwanhard's method of etching to that which is here recommended, and which is ſo different from what is now followed. At preſent, the glaſs is covered with a varniſh either of iſinglaſs diſſolved in water, or of turpentine oil mixed with a little white lead, through which the figures to be etched are traced as on copper; but Schwanhard, when he had drawn his figures, covered them with varniſh, and then by his liquid corroded the glaſs around them. His figures, therefore, when the varniſh was removed, remained ſmooth and clear, appearing raiſed from a dim or dark ground; and M. Beckmann, who perſuaded ſome ingenious artiſts to make trial of this antient method of etching, declares, that ſuch figures have a much better effect than thoſe which are cut into the glaſs.

Before concluding this article, it may be worth while juſt to mention a propoſal which has been lately made to employ glaſs inſtead of copper for throwing off prints in the rolling preſs. That it is poſſible to uſe glaſs plates of great thickneſs for this purpoſe, it would be raſh to deny; but the ſuperiority of ſuch plates to thoſe of copper we cannot conceive. If not broken in pieces in the rolling preſs, they would doubtleſs laſt longer; but the expence of them at firſt would probably be greater, and the engraving on them could not be ſo fine.

GLASTONBURY, a townſhip in Bennington co. Vermont, having only 34 inhabitants. It has good intervale lands, and lies N. E. of Bennington, adjoining.—*Morſe.*

Glastonbury, a handſome little town in Hartford co. Connecticut, ſituated on the eaſt ſide of Connecticut river, oppoſite to Weathersfield, and of which it formed a part until 1690. In the townſhip are 2 meeting houſes; and on Roaring Brook and other ſmall ſtreams are 17 mills of different kinds and 1 forge.—*ib.*

GLOSSOCOMMON, in mechanics, is a name given by Heron to a machine compoſed of divers dented wheels with pinions, ſerving to raiſe huge weights.

GLOUCESTER *Houſe*, belonging to the Hudſon's Bay Company, is ſituated in New South Wales, on the N. ſide of the waters which form a communication through a chain of ſmall lakes, between Winnepeg Lake and Albany river. Henley Houſe lies N. E. of this, nearer the mouth of Albany river, in James' Bay. N. lat. 54. W. long. 87. 30.—*Morſe.*

Gloucester, or *Cape-Ann*, a townſhip in Eſſex co. Maſſachuſetts, whoſe eaſt point forms the north ſide of the bay of Maſſachuſetts. It contains 5317 inhabitants, and is divided into 5 pariſhes, and has beſides a ſociety of Univerſaliſts. This is a poſt-town and port of entry. The harbour is very open and acceſſible to large ſhips; and is one of the moſt conſiderable fiſhing towns in the Commonwealth. At the harbour, properly ſo called, are fitted out annually from 60 to 70 bankers; and from Squam and Sandy Bay, two ſmall out ports, the bay fiſhery is carried on with great ſpirit, and to a large amount. The exports for one year, ending Sept. 30, 1794, amounted in value to 229,613 dollars. Thatcher's Iſland, on which are two lights of equal height, lies cloſe to the S. E. ſide of the townſhip, which is itſelf joined to the continent by a beach of ſand which is very rarely overflowed by the water. There is a very fine white ſand here fit for making glaſs. The harbour is defended by a battery and citadel erected in 1795. It is 16 miles N. E. by E. of Salem, and 34 N. E. of Boſton.—*ib*

Gloucester, the north-weſternmoſt townſhip, and the largeſt, in Providence co. Rhode-Iſland, having Connecticut on the weſt, and Maſſachuſetts on the north; and contains 4025 inhabitants.—*ib.*

Gloucester *County*, in New-Jerſey, is bounded north by Burlington co. ſouth by Salem, Cumberland, and Cape May counties, eaſt by the Atlantic Ocean, and weſt by Delaware river. Its length on the Delaware is about 30 miles, and on the ſea the line is about 22 miles. Great and Little Egg Harbour rivers are both navigable for veſſels of 200 tons about 20 miles from their mouths. The ſtreams which fall into Delaware river are navigable for ſmall veſſels, a few miles up from their mouths, and afford ſome ſhad, rock, herrings, and perch. The adjacent iſlands are Red Bank, Pett, and Old Man's Creek Iſlands. The firſt of which is famous in the hiſtory of the American war, for the deſperate defence the garriſon upon it made, to prevent the Britiſh fleet from paſſing up to Philadelphia. The ſoil of this county is a mixture of ſand and loam, and the tract bordering on the Delaware is in a high ſtate of cultivation. The chief productions are beef, pork, fiſh, hay, corn, lumber, butter, cheeſe, &c. It is divided into 10 townſhips, viz. Woodbury, Waterford, Newtown, Glouceſter Townſhip, Glouceſter Town, Deptford, Greenwich, Woolwich, Egg Harbour, and Galloway. The firſt 8 lie along the Delaware, and the other two on the ocean. Mulicus river divides this county from Burlington, and is navigable 20 miles for veſſels of 60 tons. Maurice river riſes here, runs ſoutherly about 40 miles through Cumberland co. into Delaware Bay, is navigable for veſſels of 100 tons 15 miles, and for ſhallops 10 miles farther. It contains 13,172 free inhabitants, and 191 ſlaves. There are found in this county quantities of bog iron ore, which is manufactured into pig and bar iron, and hollow ware. Here is alſo a glaſshouſe. Chief town, Woodbury, 9 miles S. of Philadelphia.—*ib.*

Glouceſter, a ſmall town in the above county, on the eaſt ſide of Delaware river, 3 miles below Philadelphia. It was formerly the county town, but has now ſcarcely the appearance of a village.—*ib.*

Glouceſter, a poſt-town in Virginia, ſituated in the county of its own name, on a point of land on the N. ſide of York river, partly oppoſite York-Town, 17 miles diſtant.—*ib.*

Glouceſter *County*, in Virginia, is fertile and well cultivated, bounded N. by Piankitank river, which ſeparates it from Middleſex, eaſt by Mathews co. and Cheſapeak Bay, N. W. by King and Queen, S. and S. W. by York river, which divides it from York co. It is about 55 miles in length, and 30 in breadth, and contains 13,498 inhabitants, including 7063 ſlaves. The low lands here produce excellent barley, and Indian corn, the ſtaple produce of the county. Tobacco is little attended to.—*ib.*

Glouceſter *Houſe*, in the territory of the Hudſon's Bay Company, is on the N. ſide of Muſquacobaſton Lake, 120 miles weſt of Oſnaburgh houſe. N. lat. 51. 24. W. long. 86. 59.—*ib.*

GLUCINA (a), a peculiar earth diſcovered by Vauquelin in the beryl and the emerald. Its general properties are as follows: 1. It is white: 2. Inſipid; 3. Inſoluble in water; 4. Adheſive to the tongue; 5. Infuſible; 6. Soluble in the fixed alkalis; 7. Inſoluble in ammoniac; 8. Soluble in the carbonate of ammoniac; 9. Soluble in almoſt every one of the acids (except the carbonic and phoſphoric acids), and forming ſalts of a ſaccharine taſte; 10. Fuſible with borax into a tranſparent glaſs; 11. Abſorbs one fourth of its weight of carbonic acid; 12. Decompoſes the aluminous ſalts; 13. Is not precipitable by well ſaturated hydro-ſulphurets.

The ſpecific characters of glucina, which are united in none of the other known earths, are; 1. Its ſalts are ſaccharine, and ſlightly aſtringent; 2. It is very ſoluble in the ſulphuric acid by exceſs; 3. It decompoſes the aluminous ſalts; 4. It is ſoluble in the carbonate of ammoniac; 5. Is completely precipitated from its ſolutions by ammoniac; 6. Its affinity for the acids is intermediate between magneſia and alumine.

One hundred parts of beryl contain 16 of glucina; but for the beſt method of analyzing the beryl, and of courſe obtaining the earth, we muſt refer our readers to the article Mineralogy in this *Supplement;* and ſhall conclude this ſhort article with a valuable and judicious remark of Vauquelin's.

"It almoſt always happens (ſays this able chemiſt), in the ſciences of obſervation, and even in the ſpeculative ſciences, that a body, a principle, or a property, formerly unknown, though it may often have been uſed, or even held in the hands, and referred to other ſimple ſpecies, may, when once diſcovered, be afterwards found in a great variety of ſituations, and be applied to many uſeful purpoſes. Chemiſtry affords many recent examples of this truth. Klaproth had no ſooner diſcovered the different ſubſtances with which he has enriched the ſcience, but they were found in various other bodies; and if I may refer to my own proceſſes, it will be ſeen, that after I had determined the characters of chrome, firſt found in the native red lead, I eaſily recognized it in the emerald and the ruby. The ſame has happened with regard to the earth of the beryl. I have likewiſe detected it in the emerald; in which, nevertheleſs, it was overlooked both by Klaproth and myſelf in our firſt analyſis: ſo difficult it is to be aware of the preſence of a new ſubſtance, particularly when it poſſeſſes ſome properties reſembling thoſe already known!"

GLYNN *County*, in the Lower diſtrict of Georgia, bounded eaſt by the ocean, north by Alatamaha river, which ſeparates it from Liberty co. and ſouth by Camden co. It contains 413 inhabitants, including 215 ſlaves. Chief town, Brunſwick.—*Morſe.*

GNADENHUETTEN, or *Gnadenhutten*, a ſettlement of the Moravians, or United Brethren, on Muſkingum river, oppoſite to Salem, in the lands which belonged to the Mahikan Indians. In 1746 it was a pleaſant town, inhabited by Chriſtian Indians, where were a chapel, miſſionary's houſe, and many Indian houſes. This together with Schoenbrun and Salem were reſerved by Congreſs, by an ordinance, May 20, 1785, for the Chriſtian Indians formerly ſettled there; Sept. 3, 1788, it was reſolved that the plat of each town ſhould make up 4,000 acres, and the grant was made to the United Brethren for propagating the goſpel among the heathen.—Alſo the name of a Moravian ſettlement on the ſouth-weſt bank of Lehigh river, in Pennſylvania, about 29 miles north-weſt of Bethlehem.—*ib.*

GOAT *Iſland*, in the State of Rhode-Iſland, a ſmall iſlot, oppoſite to the town of Newport, and on which is Fort Waſhington. The fort has been lately repaired, and a citadel erected in it. The fort has been ceded to the United States.—*ib.*

(a) This name was given to the earth of beryl by the editors of the *Annales de Chemie*. Its moſt characteriſtic property being that it forms ſalts of a ſaccharine taſte, they gave it a name derived from γλυκαινω, *to render ſweet.* According to this etymology, ſhould not the name be *Glycina ?*

Goave | Gold.

GOAVE LE PETIT, one of the weſt juriſdictions of the French part of St Domingo. It contains 5 pariſhes, is the unhealthieſt part of the colony, the inhabitants being ſubject to conſtant fevers, occaſioned by the badneſs of the waters. Its dependencies, however, are healthy, and remarkable for the culture of coffee. Exports from Jan. 1, 1789, to Dec. 31, of the ſame year; 27,090 lbs white ſugar—655,187 lbs brown—807,865 lbs coffee—50,053 lbs cotton—and 210 lbs indigo. The town of the ſame name is ſituated on the narroweſt part of the ſouth-weſtern peninſula, on the north ſide of the neck.—*Morſe.*

GOELANS, POINT AU, a promontory on the north ſide of Lake Ontario, about 33 miles ſouth-weſterly of Fort Frontinac.—*ib.*

GOFFSTOWN, in Hillſborough county, New-Hampſhire, on the weſtern bank of Merrimack river, 3 miles from Amuſkeag Falls, and 60 miles weſt of Portſmouth. It was incorporated in 1761, and contains 1,275 inhabitants. Some pieces of baked earthen ware have been found in this townſhip, from which it is ſuppoſed that the Indians had learned the potters art; but of what antiquity theſe remnants are, is uncertain.—*ib.*

GOLD, the moſt perfect of all the metals. See CHEMISTRY-*Index* in this *Supplement*.

It has been a very common opinion among metallurgiſts, that tin has the property of deſtroying the ductility of gold, on being melted with it even in very ſmall quantities; and Dr Lewis adds, that even the vapours which ariſe from tin in the fire, make gold ſo brittle, that it flies in pieces under the hammer. This opinion was controverted by Staneſby Alchorne, Eſq; of his Majeſty's mint, who made a ſet of experiments, which, in his opinion, authoriſe a very different concluſion, viz. that though tin, like other inferior metals, will contaminate gold in proportion to the quantity mixed with it, yet there does not appear in tin any thing ſpecifically inimical to that precious metal.

As we have elſewhere (See CHEMISTRY, n° 1091, &c. *Encycl.*) enumerated theſe experiments, and admitted the concluſion drawn from them, it becomes our duty, in this place, to ſtate what has been urged againſt that concluſion.

M. Tillet, being in his own mind perſuaded that tin renders gold ſo brittle that it cannot be reduced to thin leaves, and far leſs be made to paſs through the wire plate but by virtue of repeated annealing, and peculiar treatment, which gold of the uſual ductility does not require, determined, from reſpect to M. Alchorne, to repeat his experiments.

His firſt experiment * conſiſted in mixing 24 grains of fine gold with one of tin which contained no arſenic. He wrapped the grain of tin in the 24 grains of gold reduced to a very thin leaf, and placed the whole upon a piece of charcoal, ſo hollowed out as to ſupport the mixed metal during fuſion. He even ſprinkled a ſmall quantity of calcined borax upon the metal, in order that the fuſion might be more ſudden, that the metal might flow together, and the tin unite with the gold, without allowing time for it to become calcined. This alloy was ſpeedily fuſed by the enameller's lamp, and reduced into a ſmall button without any loſs of weight. It was then flattened carefully beneath the hammer; but, notwithſtanding his utmoſt precaution in this reſpect, it cracked, and at laſt broke into three pieces, its thickneſs then being a quarter of a line or thereabouts. He repeated this experiment with a double quantity as well of pure gold as of tin, and the reſult was the ſame.

Gold.

He next alloyed 4 ounces of gold, of the fineneſs of 22 carats, with 1 gros 24 grains of tin deprived of arſenic, or, in other words, with 4 pennyweights of tin; and theſe two metals being reduced into ſmall pieces, were mixed together, put into a crucible, and urged by the ſtrong heat of a forge with two pair of bellows. When their fuſion appeared to be complete, he poured the metal into a ſmall ingot mould proportioned to the quantity.

The ingot thus obtained had loſt ſcarcely any thing of the weight of the two metals that compoſed it; which was a proof that the tin had united and incorporated with the four ounces of gold. But on attempting to bend the ingot, which was about ſix inches long, and not more than two or three lines thick, he remarked, contrary to the nature of gold of 22 carats, that it was rigid, and would have required a conſiderable effort to give it any degree of curvature, or bring it to the flexibility it would have poſſeſſed if no tin had entered into its compoſition. Not ſatisfied, however, with the inference naturally flowing from this circumſtance, he proceeded to the proper teſt by hammering, particularly with the edge of the hammer, in order that the bar might be lengthened, and by that means ſubmitted to the moſt deciſive proof. He did not obſerve, during the continuation of this proceſs, till the bar was reduced to about two-thirds of its firſt thickneſs, that its edges were cracked, or exhibited much of the appearance of brittleneſs; but as he was apprehenſive that this accident might happen by too long hammering, he divided the bar by cutting off the part which had been hammered out. This part was placed in the midſt of lighted charcoal, in order that, by a moderate annealing, it might recover the ſtate of malleability it poſſeſſed before it was hammered. But when he went to take it out of the fire, where it had undergone no greater heat than a cherry-red, he found it divided into two parts. After having ſuffered theſe to cool, he forged them again. They were extended with conſiderable eaſe, though with ſome cracks at the edges; but they did not yet ſatisfy the whole of his enquiries. He therefore annealed one of the two laſt mentioned pieces a ſecond time, and reſerved the other in its hard-hammered ſtate to be paſſed between the laminating rollers. The annealed part, which might have the thickneſs of about a ſhilling, broke in the fire, though the heat was very gentle, into four or five portions. The longeſt of theſe portions, which beſt reſiſted the action of the fire, bent and twiſted itſelf, and ſhewed, by this ſtate of ſtrong contraction in different directions, that it had tended to break and become divided into ſmall portions, ſimilar to thoſe which had already ſeparated from it.

Satisfied by this experiment that the piece of the mixed ingot which he had kept in its hammer-hardened ſtate would not bear annealing, he determined to extend it ſtill more between the rollers, ſetting them up very gradually, in order that the fracture, if it ſhould take place, might be principally owing to the brittleneſs of the material, and not to the force of compreſſion to which it was ſubjected. By this management he ſucceeded in extending the metal to double its length notwithſtanding its hardneſs, and rendering it as thin as ſtrong paper; though the edges were cracked through their whole length like the teeth of a ſaw. But this accident is not at all ſurpriſing, when it is conſidered that gold, though alloyed ſimply with copper, whatever may be the cauſe, does not poſſeſs its uſual ductility, particularly when it is laminated very thin, without repeated annealing as the metal becomes hard.

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* Memoirs of the Academy of Sciences at Paris for the year 1790.

Aware that the fracture of the pieces of gold might be attributed to an incomplete fuſion, or unequal mixture of the two metals, he melted the whole ingot over again with the utmoſt precaution; but in vain. The metal was as brittle as formerly, and would not bear annealing.

He next fuſed 6 ounces of pure gold of 24 carats with 2 gros, or 6 penny-weights of tin, taking every poſſible precaution to have the metals completely mixed. When the whole was in perfect fuſion, he poured the mixture into an ingot mould, and obtained an ingot rather longer and cleaner than the two former. As ſoon as it was cold he forged one of its extremities with the edge of the hammer. It was lengthened without any perceptible crack; and when it was reduced to the thickneſs of one line, or thereabouts, he cut it off for ſeparate treatment. By moderate annealing it maintained its integrity; and, with the exception of a few cracks, it paſſed the laminating rollers without breaking. As he was fearful, nevertheleſs, that it might break in ſome part if he continued to laminate it, he gave it a ſlight annealing. It had ſcarcely acquired a cherry-redneſs between the charcoal, before it broke into five or ſix parts, ſome of which were ſimply bended or twiſted, and others flat as they quitted the rollers. Among the annealed pieces of this extremity of the ingot, there was one ſufficiently long, though a little curled, which he laminated a ſecond time, with the determination of rendering it very thin without the leaſt annealing. It acquired at leaſt double the length it had at firſt without breaking; and, if we except the two ſides of this plate which were cracked, the body, or main piece, was entire. It was ſpongy, and might be conſidered as if formed out of an ingot of common gold containing no tin, but not poſſeſſing the whole of its natural ductility.

"It follows, ſays M. Tillet, from theſe experiments, that gold, whether fine or alloyed, when perfectly fuſed with a ſmall portion of the fineſt tin, acquires rigidity and hardneſs by the mixture; that it loſes ſomewhat of its diſtinguiſhing colour; and that it may, indeed, by careful management, be extended to a certain degree by the hammer, or ſtill better by the rollers; but that, as it cannot be annealed without danger of breaking, it is by this defect deprived of the eſſential advantage of recovering its original ſoftneſs after it has been ſtrongly hammer-hardened. It is not but by careful management in the uſe of the hammer, and by frequent annealing, that artiſts employed on works of gold and ſilver ſucceed in obtaining them without cracks, and bringing them to a ſtate of perfection, without being obliged to have recourſe to ſolder to repair the defects which exceſſive hardneſs under the hammer would occaſion. How much, therefore, ought gold-workers, who continually have this metal in their hands, to be attentive to prevent the introduction of tin in their workſhops, and never to employ ſuch compounds of gold as are ſubject to break, or even to warp, while annealing? The expence of refining, which they would pay for depurating ſuch compounds, would be of leſs conſequence to them than the loſs of time required for the careful management of ſuch gold contaminated by tin, even if they did ſucceed in uſing it, and were not often forced to abandon, after much labour, a work nearly finiſhed.

"If it be allowable (continues our author) to form conjectures on the cauſe of the fracture of plates of gold containing tin, when ſubjected to the annealing heat, it may be preſumed, ſince tin very ſpeedily melts, while gold requires a ſtrong heat for its fuſion, that the parts of the tin intermixed in a ſort of proportional equality with thoſe of the gold, tend to ſeparate by a ſpeedy fuſion and at a very gentle degree of heat; that they remain without conſiſtence between the parts of the gold, while the latter preſerve the whole of their ſolidity, and do not loſe it even by the annealing heat: whence it ſeems, that the parts of the precious metal, when ignited among the coals, having no longer the ſolid connection formed by the tin, but, on the contrary, having an infinite number of ſmall cavities occupied by particles of that metal in fuſion, muſt tend to diſunion; whereas the ſame accident does not take place in the pieces which have reſiſted the annealing, and have been laminated after cooling, becauſe the particles of tin have become ſolid by cooling, and have recovered their original ſtate of union with the gold.

"This fracture of the compound does not take place with an alloy of gold and copper, for an oppoſite reaſon to that which has here been explained; namely, becauſe theſe two metals require nearly the ſame heat for their fuſion. The effect of annealing being therefore equal upon both, the metals, notwithſtanding this treatment, preſerve their natural conſiſtence, even tho' the heat be carried near the point of fuſion."

Gold-Leaf. See *Gold-Leaf* (Encycl.) where a full account is given from Dr Lewis of the proceſs of gold-beating. In that article, we have ſaid that gold-leaf ought to be prepared from the fineſt gold; but Mr Nicholſon, who, in all probability, knows much more of the matter than the author from whom our account was copied, aſſures us that this is a miſtake, and that pure gold is too ductile to be worked between the gold-beater's ſkin. The neweſt ſkins will work the fineſt gold, and make the thinneſt leaf, becauſe they are the ſmootheſt. Old ſkins, being rough or foul, require coarſer gold. The finer the gold, the more ductile; inſomuch that pure gold, when driven out by the hammer, is too ſoft to force itſelf over the irregularities, but would paſs round them, and by that means become divided into narrow ſlips. The fineſt gold for this purpoſe has three grains of alloy in the ounce, and the coarſeſt twelve grains. In general, the alloy is ſix grains, or one eightieth part. That which is called pale gold contains three pennyweights of ſilver in the ounce. The alloy of leaf gold is ſilver, or copper, or both, and the colour is produced of various tints accordingly. Two ounces and two pennyweights of gold is delivered by the maſter to the workman, who, if extraordinarily ſkilful, returns two thouſand leaves, or eighty books of gold, together with one ounce and ſix pennyweights of waſte cuttings. Hence one book weighs 4.8 grains; and as the leaves meaſure 3.3 inches in the ſide, the thickneſs of the leaf is one two hundred and eighty-two thouſandth part of an inch.

The yellow metal called Dutch gold is fine braſs. It is ſaid to be made from copperplates, by cementation with calamine, without ſubſequent fuſion. Its thickneſs, compared with that of leaf gold, proved as 19 to 4, and under equal ſurfaces it is conſiderably more than twice as heavy as the gold. *Nicholſon's Journal, Vol. 1ſt.*

GOLD *River*, ſituated in Terra Firma, on the iſthmus of Darien, ſouthward of the river Santa Maria; affording much gold duſt, from whence it has its name.—*Morſe.*

GOLDEN *Iſland* lies at the mouth of the river or gulf of Darien, in the province of Terra Firma, in South America, N. lat. 9°. W. long. 77° 10′.—*ib.*

GOLDONI (Charles), was born at Venice in the year 1707. He gave early indications of his humourous character, as well as his invincible propenſity to thoſe ſtudies which have rendered his name immortal. His father, perceiving that the darling amuſement of his ſon was dramatic performances, had a ſmall theatre erected in his own houſe, in which Goldoni, while yet an infant, amuſed himſelf with three or four of his companions, by acting comedies. Before he was ſent to ſchool, his genius prompted him to become an author. In the ſeventh and eighth years of his age, ere he had ſcarcely learned to read correctly, all his time was devoted to the peruſing comic writers, among whom was *Cicognini*, a Florentine, little known in the dramatic commonwealth. After having well ſtudied theſe, he ventured to ſketch out the plan of a comedy, which needed more than one eye-witneſs of the greateſt probity to verify its being the production of a child.

After having finiſhed his grammatical ſtudies at Venice, and his rhetorical ſtudies at the Jeſuit's college in Perugia, he was ſent to a boarding-ſchool at Rimini, to ſtudy philoſophy. The impulſe of nature, however, ſuperſeded with him the ſtudy of Ariſtotle's works, ſo much in vogue in thoſe times. He frequented the theatres with uncommon curioſity; and paſſing gradually from the pit to the ſtage, entered into a familiar acquaintance with the actors. When the ſeaſon of comic performances was over, and the actors were to remove to Chiozza, young Goldoni made his eſcape in their company. This was the firſt fault he committed, which, according to his own confeſſion, drew a great many others after it. His father had intended him to be a phyſician like himſelf: the young man, however, was wholly averſe to the ſtudy. He propoſed afterwards to make him an advocate, and ſent him to be a practitioner in Modena. An horrid ceremony of eccleſiaſtical juriſdiction, at which he was preſent, inſpired him with a melancholy turn, and he determined to become a capuchin.

His father, perceiving the whimſical, inconſtant humour of his ſon, feigned to ſecond this propoſal, and promiſed to go and preſent him to the guardian of the capuchins in Venice, in the hope that after ſome ſtay in that extenſive and merry city, his melancholy fit would ceaſe. The ſcheme ſucceeded; for the young man, indulging in all the faſhionable diſſipation of the place, was cured of his fooliſh reſolution. It was however neceſſary for him to be ſettled in ſome employment; and he was prevailed upon by his mother, after the death of his father, to exerciſe the profeſſion of a lawyer in Venice. By a ſudden reverſe of fortune he was compelled to quit at once both the bar and Venice. He then went to Milan, where he was employed by the reſident of Venice in the capacity of ſecretary; where becoming acquainted with the manager of the theatre, he wrote a farce entitled *Il Gondoliere Veneziano*, the Venetian Gondolier, which was the firſt comic production of his that was performed and printed. Some time after Goldoni broke with the Venetian reſident, and removed to Verona.

There was in this place, at that time, the company of comedians of the theatre of St Samuel of Venice, and among them the famous actor *Coſali*, an old acquaintance of Goldoni, who introduced him to the manager. He began therefore to work for the theatre, and became inſenſibly united to the company, for which he compoſed ſeveral pieces. Having removed along with them to Genoa, he was for the firſt time ſeized with an ardent paſſion for a lady, who ſoon afterwards became his wife. He returned with the company to Venice, where he diſplayed for the firſt time, the powers of his genius, and executed his plan of reforming the Italian ſtage. He wrote the *Momolo*, *Courtiſan*, the *Squanderer*, and other pieces, which obtained univerſal admiration.

Feeling a ſtrong inclination to reſide ſome time in Tuſcany, he repaired to Florence and Piſa, where he wrote *The Footman of Two Maſters*, and *The Son of Harlequin loſt and found again*. He returned to Venice, and ſet about executing more and more his favourite ſcheme of reform. He was now attached to the theatre of St Angelo, and employed himſelf in writing both for the company and for his own purpoſes. The conſtant toils he underwent in theſe engagements, impaired his health. He wrote, in the courſe of twelve months, ſixteen new comedies, beſides forty-two pieces for the theatre; among theſe many are conſidered as the beſt of his productions. The firſt edition of his works was publiſhed in 1753, in 10 vols. 8vo. As he wrote afterwards a great number of new pieces for the theatre at St Luca, a ſeparate edition of theſe was publiſhed under the title of *The New Comic Theatre:* among theſe was the *Terence*, called by the author his *favourite*, and judged to be the maſter-piece of his works. He made another journey to Parma on the invitation of Duke Philip, and from thence he paſſed to Rome. He had compoſed 59 other pieces ſo late as the year 1761, five of which were deſigned for the particular uſe of Marque Albergati Capacelli, and conſequently adapted to the theatre of a private company. Here ends the literary life of Goldoni in Italy.

Through the channel of the French Ambaſſador in Venice, he had received a letter from Mr Zenuzzi, the firſt actor in the Italian theatre at Paris, containing a propoſal for an engagement of two years in that city. He accordingly repaired to Paris, where he found a ſelect and numerous company of excellent performers in the Italian theatre. They were, however, chargeable with the ſame faults which he had corrected in Italy; and the French ſupported, and even applauded in the Italians, what they would have reprobated on their own ſtage. Goldoni wiſhed to extend even to that country his plan of reformation, without conſidering the extreme difficulty of the undertaking. Scurrilities and jeſts, which are ever accompanied by actions, geſtures and motions, are the ſame in all countries, and almoſt perfectly underſtood, even in a foreign tongue: while the beauties of ſentiment and dialogue, and other things which lead to the underſtanding of characters and intrigues, require a familiar acquaintance with the tongue of the writer.

The firſt attempt of Goldoni towards his wiſhed-for reform, was the piece called *The Father for Love*; and its bad ſucceſs was a ſufficient warning to him to deſiſt from his undertaking. He continued, during the remainder of his engagement, to produce pieces agreeable to the general taſte, and publiſhed twenty-four comedies; among which *The Love of Zelinda and Lindor* is reputed the beſt.

The term of two years being expired, Goldoni was preparing to return to Italy, when a lady, reader to the dauphineſs, mother to the late king, introduced him at court, in the capacity of Italian maſter to the princeſſes, aunts to the king. He did not live in the court, but reſorted there at each ſummons, in a poſt-chaiſe ſent to him for the purpoſe. Theſe journeys were the cauſe of a diſorder in the eyes, which afflicted him the reſt of his life; for being accuſtomed to read while in the chaiſe, he loſt his ſight on a ſudden, and in ſpite of the moſt potent remedies, he could never afterwards recover it entirely. For about ſix months lodgings were provided him in the chateau of Verſailles. The death, however, of the dauphin, changed the face of affairs. Goldoni loſt his lodgings, and only, at the end of three years, received a bounty of 100 louis in a gold box, and the grant of a penſion of four thouſand livres a year. This ſettlement would not have been ſufficient for him, if he had not gained, by other means, farther ſums. He wrote now and then comedies for the theatres of Italy and Portugal; and, during theſe occupations, was deſirous to ſhew to the French that he merited a high rank among their dramatic writers. For this purpoſe, he neglected nothing which could be of uſe to render himſelf maſter of the French language. He heard, ſpoke, and converſed ſo much in it, that, in his 62d year, he ventured to write a comedy in French, and to have it repreſented in the court theatre, on the occaſion of the marriage of the king.

This piece was the *Bourru Bienfaiſant*; and it met with ſo great ſucceſs, that the author received a bounty of 150 louis from the king, another gratification from the performers, and conſiderable ſums from the bookſellers who publiſhed it. He publiſhed, ſoon after, another comedy in French, called *L'Avare Faſtueux*. After the death of Louis XV. Goldoni was appointed Italian teacher to the Princeſs Clotilde, the preſent princeſs of Piedmont; and after her marriage he attended the late unfortunate Princeſs Elizabeth in the ſame capacity.

The approach of old age obliged him to quit Verſailles, and to live in Paris, the air of which, leſs ſharp, was better adapted to his conſtitution. The laſt work of Goldoni was *The Volponi*, written after his retirement from court; from which time he bade a laſting adieu to writing. Unfortunately for him he lived to ſee his penſions cut off at the revolution, like others, and he ſpent his laſt days in poverty and diſtreſs. He died in 1792, at a criſis when, according to the expreſſion of a deputy in the Convention, the French nation was ready to repay him every debt of gratitude.

Goldoni is on a par with the greateſt comic poets of modern times, with regard to dramatic talents, and is thought ſuperior to them all with regard to the fertility of his genius. His works were printed at Leghorn in 1788—91, in 31 vols. 8vo. He has been generally called the Moliere of Italy; and Voltaire, in one of his letters to Marquis Albergati, ſtyles him *The Painter of Nature*. Goldoni is one of thoſe authors whoſe writings will be reliſhed in the moſt remote countries, and by the lateſt poſterity.

GOLDSBOROUGH, a poſt-town in Hancock county, Diſtrict of Maine, containing 267 inhabitants. It was incorporated in 1789, is the ſouth-eaſternmoſt town in the county. On the waters of its harbour is the town of Waſhington. It is 47 miles eaſterly of Penobſcot, 188 ſouth-eaſt of Portland, and 330 north-eaſt of Boſton. N. lat. 44° 19′.—*Morſe*.

GOLPHINGTON, the chief town of Waſhington county, Georgia, is ſituated near the head of Ogeeche river, about 26 miles eaſt-ſouth-eaſt of Oconee town, 37 ſouth-weſt of Auguſta, and 50 north-weſt of Louiſville.—*ib*.

GOMASHTEH, in the language of Bengal, one cent.

GONAIVES, a bay in the iſland of Hiſpaniola, ſouth-eaſtward of Cape St Nicholas, in about 19° 33′ N. lat.—*Morſe*.

GONAVE, an iſland in the bay of Leogane, in the weſtern part of the iſland of St Domingo. It is 14¾ leagues long, and uniformly about 3 broad, except a very ſmall part at each extremity. *Petite Gonave*, an iſle about 2 miles each way, is ſeparated from the ſouth-eaſt corner of the former, by a channel 3 miles wide. Gonave is 13½ leagues W. by N. W. of Port-au-Prince; and its weſt point is 33½ leagues E. by N. of Cape Dame Marie.—*ib*.

GONAIVES, a ſea-port in the ſame iſland, at the head of a bay of its own name, on the north ſide of the bay of Leogane. The town is ſituated on the great road from Port de Paix to St Mark, 16 leagues ſouth-eaſt of the former and 15 N. by E. of the latter, N. lat. 19° 27′ W. long. from Paris 75° 2′ 30″.—*ib*.

GONIOMETRY, a method of meaſuring angles, ſo called by M. de Lagny, who gave ſeveral papers on this method in the Memoirs of the Royal Acad. anno 1724, 1725, 1729. M. de Lagny's method of goniometry conſiſts in meaſuring the angles with a pair of compaſſes, and that without any ſcale whatever, except an undivided ſemicircle. Thus, having any angle drawn upon paper to be meaſured, produce one of the ſides of the angle backwards behind the angular point; then with a pair of fine compaſſes deſcribe a pretty large ſemicircle from the angular point as a centre, cutting the ſides of the propoſed angle, which will intercept a part of the ſemicircle. Take then this intercepted part very exactly between the points of the compaſſes, and turn them ſucceſſively over upon the arc of the ſemicircle, to find how often it is contained in it, after which there is commonly ſome remainder: then take this remainder in the compaſſes, and, in like manner, find how often it is contained in the laſt of the integral parts of the firſt arc, with again ſome remainder: find, in like manner, how often this laſt remainder is contained in the former; and ſo on continually, till the remainder become too ſmall to be taken and applied as a meaſure. By this means he obtains a ſeries of quotients, or fractional parts, one of another, which being properly reduced into one fraction, give the ratio of the firſt arc to the ſemicircle, or of the propoſed angle to two right angles, or 180 degrees, and conſequently that angle itſelf in degrees and minutes.

We have given this account of goniometry from Dr Hutton, and frankly acknowledge that we had never thought of it till we peruſed his excellent Dictionary of Mathematics and Philoſophy. To have omitted the method when pointed out to us would have been wrong; though we miſtake much if mathematicians in general will not look upon it as a method of very little value.

GOOCHLAND, a county in Virginia, ſurrounded by Louiſa, Fluvanna, Henrico, Hanover, and Powhatan counties. It is about 40 miles long and 14 broad, and contains 9,053 inhabitants, including 4,656 ſlaves.—*ib.*

GOOD-HOPE, or Cape of Good Hope, was taken by the Britiſh, on 17th Auguſt 1796 with very little difficulty. At this we need not be much ſurpriſed, if to the diſcontent which muſt have prevailed among the planters and townſmen with the new order of things, be added the manners of the people. M. Vaillant, who was at the Cape during the laſt war, when the garriſon expected to be every day attacked by a Britiſh ſquadron, and when the people were not abſolutely diſguſted with their own government, repreſents them, however, as rendered ſo completely frivolous by imitating the manners of their French allies, that though the place was ſtrongly fortified, it could hardly be expected to hold out long againſt a vigorous and well conducted ſiege.

"The females of the Cape (ſays he) when I ſaw them for the firſt time, had really excited my aſtoniſhment by their dreſs and their elegance; but I admired in them, above all, that modeſty and reſerve peculiar to the Dutch manners, which nothing as yet had corrupted.

"In the courſe of ſix months, a great change had taken place. It was no longer the French modes that they copied; it was a caricature of the French. Plumes, feathers, ribbons, and tawdry ornaments, heaped together without taſte on every head, gave to the prettieſt figures a groteſque air, which often provoked a ſmile when they appeared. This mania had extended to the neighbouring plantations, where the women could ſcarcely be known. A mode of dreſs entirely new was every where introduced; but ſo fantaſtical, that it would have been difficult to determine from what country it had been imported."

At that time a French and a Swiſs regiment were in the garriſon; and though the town was occupied only with warlike preparations, and though an attack from the Britiſh fleet was every moment expected, the French officers had already introduced a taſte for pleaſure. Employed in the morning at their exerciſe, the French ſoldiers in the evening acted plays. A part of the barracks was transformed into a theatre; and as women capable of performing female characters could not be found in the town, they aſſigned theſe parts to ſome of their comrades, whoſe youth, delicate features, and freſhneſs of complexion, ſeemed beſt calculated to favour the deception. Theſe heroines, of a new kind, heightened the curioſity of the ſpectators, and rendered the entertainment ſtill more lively and intereſting.

To add to the general pleaſure, ladies of the firſt rank conſidered it as incumbent on them to lend to the military actors and actreſſes, their laces, jewels, rich dreſſes, and moſt valuable ornaments. But ſome of them had cauſe to repent of their condeſcenſion; for it happened more than once that the Counteſs of Almaviva having left in pledge at the ſuttling houſe her borrowed decorations, the owner, to recover them, was obliged to diſcharge not only the bill due for brandy and tobacco, but all the other debts of the heroine.

During the intoxication and giddineſs occaſioned by theſe amuſements, Love alſo did not fail to act his part; and certain little intrigues were, from time to time, brought to light, which gave employment to the tongue of ſcandal, and introduced unhappineſs into families. Hymen, it is true, amidſt theſe adventures, ſometimes intervened to repair the follies of his brother, and many marriages, which reſtored every thing to order, were the reſult of his negotiations; but the complaints, though ſtifled, did not leſs exiſt. The watchfulneſs of the mother was alert. The huſband, by ſo much the more ſecretly irritated as he ſaw himſelf obliged to conceal his jealouſy, curſed in his heart both actors and theatre; while the matronly part of the community, leſs on the reſerve, declaimed with bitterneſs againſt the licentiouſneſs that prevailed, which they wholly imputed to this mode of theatrical entertainment. At laſt, to the great mortification of the young, but to the high ſatisfaction of the old women and huſbands, the theatre was on a ſudden ſhut up. The cauſe that effected this was altogether foreign to the complaints that were made, and of a nature that it was impoſſible to foreſee. Two of the French actors, who, it muſt be remembered, were officers in the army, thought proper to imitate the paper money of the company, and to put their forged notes in circulation. The forgery was detected, and traced to its authors; the two theatrical heroes were baniſhed from the Cape; and the Company, aſhamed of the adventure, dared neither ſeek others to ſupply the vacant places, nor reſume their ſtage entertainments.

Intoxicating as were theſe pleaſures, government meanwhile had not been inattentive to the danger which threatened the colony. As they daily expected to be attacked by the Britiſh fleet, they had increaſed the means of defence, and ordered different works and new fortifications to be conſtructed.

At firſt, the buſineſs was carried on with activity and ardour; becauſe the inhabitants, inſtigated by their private intereſt, which was then conſidered as involved with that of the public, had voluntarily offered their ſervices, and mingled with the workmen. Young and old, ſoldiers and magiſtrates, ſailors and planters, all ſolicited the honour of co-operating for the general good and common ſafety. To behold this heterogeneous multitude—ſome loaded with pick-axes, and ſome with ſpades, or other ſimilar implements—marching out in the morning from the town, and proceeding in high ſpirits to the new fortifications, was a ſight truly admirable.

But this patriotic fervour was of no long continuance. Under pretence of ſparing their ſtrength, and that they might not weary themſelves to no purpoſe, they ſoon cauſed their ſlaves to follow them with the tools and inſtruments. In a little time they contented themſelves with ſending their ſlaves only; and at laſt theſe ſubſtitutes themſelves, in imitation of their maſters, or perhaps by their ſecret orders, gave over going alſo. Their enthuſiaſm, in ſhort, from the firſt moment of its breaking out till the period when it was thus entirely cooled, had been the affair of ſomething leſs than a fortnight.

This taſte for frivolity which, almoſt twenty years ago, was introduced among the Dutch in Cape-town by their good friends the French, ſpread rapidly thro' the planters, who are thus deſcribed by M. Vaillant, who certainly had the beſt opportunities of knowing them.

The planters of the Cape may be divided into three claſſes; thoſe who reſide in the vicinity of the Cape, within a diſtance of five or ſix leagues; thoſe who live farther off in the interior parts of the colony; and laſtly, thoſe who, more diſtant ſtill, are found at the extremity of the frontiers among the Hottentots.

The firſt, who are opulent proprietors, and have handſome country houſes, may be likened to what was formerly called in France *petits ſeigneurs terriers*, and differ extremely from the other planters in eaſe and luxury, and particularly in their manners, which are haughty and diſdainful. Such is the reſult of wealth. The ſecond, ſimple, kind, hoſpitable, are cultivators, who live upon the fruits of their labour. Here we have an example of the good effects of mediocrity. The laſt, poor enough, yet too indolent to derive ſubſiſtence from the ſoil, have no other reſource than the produce of ſome cattle, which they feed as they can. Like the Beduin Arabs, they think much of the trouble of driving them from canton to canton, and from one paſturage to another. This wandering life prevents them from building any ſettled habitations. When their flocks oblige them to ſojourn for a while in the ſame place, they conſtruct, in haſte, a rude kind of hut, which they cover with matts, after the manner of the Hottentots, whoſe cuſtoms they have adopted, and from whom they in no reſpect differ, but in their complexion and features. And here the evil is, that there is no preciſe ſituation in ſocial life to which theſe miſerable beings belong.

Theſe ſluggiſh tribes are held in horror by their induſtrious neighbours, who dread their approach, and remove as far from them as they can; becauſe, having no property of their own, they ſteal without ſcruple that of others, and, when in want of paſturage for their cattle, conduct them ſecretly to the firſt cultivated piece of ground that comes in their way. They flatter themſelves they ſhall not be diſcovered, and they remain till every thing is devoured. If detected in their thefts, ſquabbles and contentions enſue, and afterwards a ſuit at law, in which recourſe is had to the magiſtrate, and which commonly terminates in making three men enemies, the robber, the perſon robbed, and the judge.

Nothing can be ſo mean and cringing as the conduct of the firſt deſcription of planters, when they have any thing to tranſact with the principal officers of the company, who may have ſome influence over their lot; and nothing ſo abſurdly vain and ſo ſuperlatively inſolent as their behaviour to perſons from whom they have nothing to hope and nothing to fear. Proud of their wealth, ſpoiled by reſiding near a town, from whence they have imbibed only a luxury that has corrupted, and vices that have degraded them, it is particularly towards ſtrangers that they exerciſe their ſurly and pitiful arrogance. Though neighbours to the planters who inhabit the interior of the country, you muſt not ſuppoſe they regard them as brethren; on the contrary, in the true ſpirit of contempt, they have given them the name of Rauw-boer, a word anſwering to the loweſt deſcription of clown. Accordingly, when theſe honeſt cultivators come to the town upon any kind of buſineſs, they never ſtop by the way at the houſes of the gentry of whom we are ſpeaking; they know too well the inſulting manner in which they would be received. One might ſuppoſe them to be two inimical nations, always at war, and of whom ſome individuals only met at diſtant intervals, upon buſineſs that related to their mutual intereſts.

What is the more diſguſting in the inſolence of theſe Africans is, that the majority of them are deſcended from that corrupt race of men, taken from priſons and hoſpitals, whom the Dutch company, deſirous of forming a ſettlement at the Cape, ſent thither to begin, at their riſk and peril, the population of the country. This ſhameful emigration, of which the period is not ſo remote but that many circumſtances of it are remembered, ought to render particularly modeſt thoſe who are in the moſt diſtant manner related to it. On the contrary, it is this very idea that moſt contributes to their arrogance; as if they flattered themſelves that, under the guiſe of ſupercilious manners, they could hide the abjectneſs of their origin. If a ſtranger arrives at the Cape with the deſign of remaining and ſettling there, they conceive him to be driven from his country by the ſame wretched circumſtances which formerly baniſhed their fathers, and they treat him with the moſt ſovereign contempt.

This melancholy failing is the more to be lamented, as the contagion has ſpread through almoſt every reſidence about the Cape, which is in reality a very charming canton. Embelliſhed by cultivation, by its numerous vineyards and pleaſant country houſes, it everywhere exhibits ſo varied and delicious a proſpect, that, were it occupied by other inhabitants, it would excite no ſenſations but thoſe of pleaſure.

As we advance into the country, the planters are a ſort of farmers; and conſtitute, by their manners, cuſtoms, and occupations, a claſs by themſelves, perfectly diſtinct from that we have been deſcribing. Situated farther from the Cape, and, of conſequence, not having the ſame opportunities for diſpoſing of their commodities, they are leſs rich than the firſt. We ſee among them none of thoſe agreeable country houſes, which, placed at different diſtances from the town, embelliſh the country as we paſs, and afford ſuch charming proſpects. Their habitation, which is about the ſize of a large coach-houſe, is covered with thatch, and divided into three rooms by means of two partitions, which reach only to a certain height. The middle apartment, in which is the entrance to the houſe, ſerves at once both as a parlour and eating room. It is there that the family reſide during the day, and that they receive their tea and other viſitors. Of the two other rooms, one forms a chamber for the male children, and the other for the females, with the father and mother. At the back of the middle apartment is a farther room ſerving for a kitchen. The reſt of the building conſiſts of barns and ſtables.

Such is the diſtribution which is generally followed in the interior plantations of the colony; but nearer to the frontiers, where there does not prevail the ſame eaſe of circumſtances, the habitations are much leſs commodious. They are merely a barn, conſiſting of a ſingle room, without any diviſion, in which the whole family live together, without ſeparating, either day or night. They ſleep upon ſheep ſkins, which ſerve them alſo for covering.

The dreſs of theſe planters is ſimple and ruſtic. That of the men conſiſts of a check ſhirt, a waiſtcoat with ſleeves, a large pair of trowſers, and a hat half unlooped. The women have a petticoat, a jacket fitted to their ſhape, and a little round bonnet of muſlin. Unleſs upon extraordinary occaſions, neither ſex wear ſtockings. During a part of the year, the women even walk with their feet quite naked. The occupations of the men require that theirs ſhould have ſome covering; and this covering they make from a piece of the hide of an ox, applied and ſhaped to the foot ſoon after the animal is killed, and while the hide is yet freſh. Theſe ſandals are the only article of their dreſs which they make themſelves; the reſt is the buſineſs of the women, who cut out and prepare their whole wardrobe. Though the equipment we have mentioned conſtitute the every day dreſs of the planter, he has, however, a coat of handſome blue cloth, which he wears upon days of gala and ceremony. He has then alſo ſtockings and ſhoes, and is dreſſed exactly like an European. But this finery never makes its appearance but when he goes to the Cape; and then, indeed, is not put on till he arrives at the entrance of the town.

It is commonly in theſe journeys that they purchaſe ſuch things as they may want to refit their wardrobe. There is, at the Cape, as well as in Paris and London, a ſpecies of old-clothes-men, who deal in commodities of this ſort; and who, from their enormous profits, and the extortion they practiſe, they have obtained the name of *Capſe Smouſe*, or Cape Jews. Theſe traffickers contrive, at all times, to ſell their goods at a dear rate; but they vary their price in proportion as their ſtock is great or ſmall; of courſe they bear no fixed price; and the planter who comes from the deſert, and who can underſtand but little of this fluctuation, is ſure to be duped.

On the other hand, the regular ſhopkeeper, who knows the probity of theſe farmers, and how punctual they are in the payment of their debts, exerts every effort to prevail on them to open an account with him. He tempts them by the pretended cheap price and excellent quality of his ſtuffs, and offers to remit the payment till their next journey in the following year. It is ſeldom that theſe people, ſimple and unexperienced as they are, perceive the craft that is preſented to them under this guiſe of kindneſs and civility. If they ſuffer themſelves to be prevailed upon, they are ſhackled for life. Upon their return, there are new purchaſes to be made upon the ſame conditions; and thus, year after year, always in debt, always buying without prompt payment, they become the prey of an extortioner, who raiſes to himſelf a fortune out of their weakneſs.

It is true, theſe buyers, after being thus duped at the Cape, commonly return home only to make dupes of others. The cunning that has been employed to deceive them, they employ in their turn to tempt the Hottentots who are in their ſervice. The remnants of ſtuff, or the frippery garments which they bring back, are ſold to theſe unfortunate ſervants with ſo great a profit, that commonly the wages of a year are inadequate to the payment, and they find themſelves, like their maſters, in debt for the year that is to come. In the end, therefore, it is the poor Hottentot that pays for the extortion at the Cape.

Cuſtom has rendered the planters inſenſible to the want of fruit and pulſe, though the ſoil is admirably adapted to the cultivation of both. The facility with which they rear their cattle makes up for this privation, as their flocks afford them plenty of proviſion. The chief food is mutton; and their tables are loaded with ſuch profuſion as to diſguſt one at the ſight.

From this mode of living, cattle are in the colonies, as in other places, not only a uſeful object, but an article of the firſt neceſſity. The planter undertakes himſelf the care of watching over his flocks. Every evening, when they return from the field, he ſtands at his door, with a ſtick in his hand, and counts them over one by one, in order to be ſure that none of them are miſſing.

People who have no other employment than a little agriculture, and the ſuperintendance of a flock, muſt have long intervals of idleneſs. It is thus with the planters, particularly thoſe who live in the interior parts of the country, and who being unable, on account of their diſtance from the Cape, to diſpoſe of their corn, never raiſe more than is ſufficient for their own conſumption. From the profound inaction in which they live, one would ſuppoſe their ſupreme felicity to conſiſt in doing nothing. They ſometimes, however, viſit each other; and upon theſe occaſions the day is ſpent in ſmoking, and drinking tea, and in telling, or liſtening to tales of romance, that are equal neither in merit nor morality to the ſtory of Blue-beard.

As every man always carries with him, wherever he goes, both a pipe, and a tobacco pouch made of the ſkin of the ſea-calf, he is ſure in theſe viſits to have one ſource of amuſement. When any one of the company is deſirous of lighting his pipe, he takes out his pouch, and, having filled, paſſes it to the reſt. This is a civility that is never omitted. However numerous may be the party, every body ſmokes: the conſequence of which is a cloud, that, riſing at firſt to the upper part of the room, increaſes, by degrees, till it fills the whole houſe, and becomes at laſt ſo thick, that it is impoſſible for the ſmokers to ſee one another.

When a ſtranger travelling through the country is received by the maſter of a houſe, he inſtantly becomes a member of the family. Accuſtomed to a domeſtic life, the planters delight in the ties of affinity, and conſider in the light of a relative every perſon whom they love. Upon entering a houſe, the form of ſalutation is, to ſhake hands firſt with the maſter, and then with every male perſon in the company arrived at years of maturity. If there happens to be any one whom we do not like, the hand is refuſed to him; and this refuſal, of ſo common a teſtimony of friendſhip, is looked upon as a formal declaration that the viſitor conſiders him as his enemy. It is not the ſame with the females in the company. They are all embraced one after another, and to make an exception would be a ſignal affront. Old or young, all muſt be kiſſed. It is a benefice with the duties attached to it.

At whatever time of the day you enter the houſe of a planter, you are ſure to find the kettle and tea-things upon the table. This practice is univerſal. The inhabitants never drink pure water. If a ſtranger preſents himſelf, it is tea they offer him for refreſhment. This is their common liquor in the interval of meals, and in one ſeaſon of the year, when it often happens that they have neither beer nor wine, is their only beverage.

If a ſtranger arrives at dinner-time before the cloth is taken away, he ſhakes hands, embraces, and immediately ſeats himſelf at the table. If he wiſhes to paſs the night, he ſtays without ceremony, ſmokes, drinks tea, aſks the news, gives them all he knows in his turn; and the next day, the kiſſing and ſhaking hand being repeated, he goes on his way, to perform elſewhere the ſame ceremony. To offer money on theſe occaſions would be regarded as an inſult.

Theſe particulars of a people, whoſe condition it is to be hoped that the generoſity of the Britiſh character, and the mildneſs of the Britiſh government, will gradually meliorate, cannot but be acceptable to many of our readers. We ſhall, therefore, make no apology for the length of this article.

GOOSE *Creek*, a river which falls into Potowmac river, about a mile ſouth-eaſt of Thorpe, in Fairfax county, Virginia.—*Morse.*

GOOSEBERRY *Mountain*, in New-York State, lies on the weſt bank of Hudſon's river, about 4 miles ſouth of Fort George.—*ib.*

Gooseberry *Iſlands* and *Rocks*, on the coaſt of Eſſex county, Maſſachuſetts, have been the occaſion of the loſs of many valuable veſſels. To prevent ſuch accidents in future, ſeamen may attend to the following particular information, which is here inſerted for their benefit. The north part of Gooſeberry great rock with the north of Cat Iſland, bears S. 54. W. from the beacon on Baker's Iſland. The weſtern Gooſeberry S. 41. W. the diſtance nearly three-fourths of a mile. The northern part of the weſtern Gooſeberry is viewed from the beacon over the point of land running out from it. The eaſtern Gooſeberry bears S. 26. W. and it is ſhoal as far as the weſtern breaker. The eaſtern breaker lies S. 35. E. and the weſtern breaker S. 29. E. The eaſtern breaker is about the ſame diſtance from the beacon, as the weſtern Gooſeberry, but the eaſtern Gooſeberry falls within that diſtance. Satan appears S. 32. W. and halfway rock S. 3. W. at the diſtance of 2½ miles. The inner part of Cat Iſland is above 2 miles from the beacon, and with the beacon to the ſouthward the Gooſeberry rock bears only 12 minutes. The weſtern dry breaker extends from 28 to 32; and the eaſtern from 31 to 32. Halfway rock with the beacon from Cat Iſland is 65 to the ſouthward.—*ib.*

GORHAM, a townſhip in Cumberland county, Maine, on the north-eaſt ſide of Saco river, 15 miles from Pepperelborough at the mouth of the river, and 130 miles N. by E. of Boſton. It was incorporated in 1764, and contains 2,244 inhabitants.—*ib.*

GOSHEN, a townſhip in Hampſhire county, Maſſachuſetts, between Cummington and Conway, 14 miles north of Northampton, and 112 W. by N. of Boſton. It was incorporated in 1781, and contains 681 inhabitants.—*ib.*

Goshen, a townſhip in Addiſon county, Vermont, adjoining to Saliſbury on the weſt, and 21 miles N. E. by N. of Mount Independence.—*ib.*

Goshen, a townſhip in Cheſter county, Pennſylvania.—*ib.*

Goshen, a town in Litchfield county, Connecticut, famous for the production of excellent cheeſe. It is 7 miles N. by N. W. of Litchfield, and 50 northward of New-Haven.—*ib.*

Goshen, the moſt conſiderable town in Orange county, New-York, about 58 miles north of New-York city, 20 W. by S. of New-Windſor, and 30 W. by S. of Fiſh-Kill. This town is pleaſantly ſituated, containing about 60 or 70 houſes, an academy, court-houſe, gaol, and Preſbyterian church. The townſhip contains 2,448 inhabitants; of whom 316 are electors.—*ib.*

GOSHGOSHINK, a Moravian ſettlement in Pennſylvania, ſituated on Alleghany river, about 15 miles above Venango, or Fort Franklin.—*ib.*

GOSPORT, formerly called *Appledore*, a fiſhing town on Star Iſland, one of the iſles of Shoals, belonging to Rockingham county, New-Hampſhire, containing 93 inhabitants. It lies about 12 miles E. S. E. of Piſcataqua harbour.—*ib.*

GOTHIC Architecture, See *Gothic Architecture* in this *Supplement*, and Roof, *Encyclopædia*.

GOUVERNANTE, the Spaniſh name of a plant which the Indians of California uſe in decoction as a ſudorific drink for the cure of the venereal diſeaſe. It is thus deſcribed in the third volume (Engliſh tranſlation) of Peyrouſe's Voyage round the world.

Calyx quadrifid, egg-ſhaped, of the ſame ſize with the corolla; placed beneath the fruit, deciduous. Corolla polypetalous; petals four, ſmall, entire, egg ſhaped, fixed upon the receptacle. Stamina, eight, fixed to the receptacle, of the ſame length as the corolla: threads channelled, concave on the one ſide, and convex on the other; wings veiled, antheræ ſimple. Piſtil, germ oblong, covered, with five angles, and five cells; ſeeds oblong; pericarpium covered with fine hairs.

This plant is a ſhrub of middle ſize; the branches are angular and knotty, and covered with an adheſive varniſh; the lateral branches are alternate, and placed very near to each other: the leaves are ſmall, petiolated, bilobed, oppoſite, ſmooth on the upper ſide, the under ſide indiſtinctly veined; the bloſſoms are axillary, ſometimes terminating, pedunculated, ſolitary, but ſometimes in pairs.

From this deſcription, the gouvernante appears to be a new ſpecies of *daphne*.

GRACIAS A DIOS, a town belonging to the province of Honduras, or Comaiagua, and audience of Guatimala. It is ſituated at the mouth of a river upon a rocky mountain, which has ſome gold mines in its neighbourhood. It was built the ſame year as was Vallidolid, the capital, (from which it lies about 27 leagues to the weſt) for the ſecurity of the miners. Alſo a cape on this coaſt diſcovered by Columbus, N. lat. 14° 36′ W. long. 84° 12′.—*Morse.*

GRAFTON *County*, in New-Hampſhire, is bounded north by Canada; ſouth by the counties of Strafford, Hillſborough, and Cheſhire; weſt by the State of Vermont, and eaſt by the Diſtrict of Maine. It comprehends nearly as much territory as all the other four counties, but is by no means ſo thickly ſettled. It it divided into 50 townſhips, and 17 locations, and contains 13,472 inhabitants, of whom 21 are ſlaves. The increaſe of population ſince the enumeration of 1790 has been great.—*ib.*

GRAFTON, a townſhip in the county of its name in New-Hampſhire, 13 miles S. E. of Dartmouth college and 19 S. W. of Plymouth. It was incorporated in 1778, and contains 403 inhabitants. *Lapis ſpecularis*, commonly called iſing-glaſs, of the beſt quality, is found in this town, in a mountain about 20 miles eaſtward of Dartmouth college. It is found adhering to the rocks of white or yellow quartz, and lying in laminæ, like ſheets of paper. It is found in other places in the State in ſmaller pieces.—*ib.*

GRAFTON, the *Haſſanamiſco* of the Indians, a townſhip in Worceſter county, Maſſachuſetts, containing 900 inhabitants; 40 miles S. W. of Boſton, 8 eaſterly of Worceſter, and 34 N. W. of Providence.—*ib.*

GRAINGER, FORT, ſtands on the N. ſide of the mouth of Holſton river in Tenneſſee.—*ib.*

GRAINGER, the name given to a new county, in the diſtrict of Hamilton, State of Tenneſſee, formed of parts of the counties of Knox, Jefferſon and Hawkins, and called after the maiden name of the Lady of Gov. William Blount.—*ib.*

GRANBY, a townſhip in Eſſex county, Vermont.—*ib.*

GRANBY, a townſhip in Hampſhire county, Maſſachuſetts, E. of South-Hadley, about 90 miles weſterly of Boſton; was incorporated in 1768, and contains 596 inhabitants.—*ib.*

GRANBY, a townſhip in Hartford county, Connecticut, on the line which ſeparates Connecticut from Maſſachuſetts. It was formerly a part of Symſbury, and is 18 miles north of Hartford.—*ib.*

GRANBY, a ſmall town on the Congaree, in S. Carolina, about 2 miles below the junction of Broad and Saluda rivers. Here a curious bridge has been built, whoſe arches are ſupported by wooden pillars, ſtrongly ſecured in iron work, fixed in the ſolid rock. Its height is 40 feet above the level of the water. The centre arch is upwards of 100 feet in the clear, to give a paſſage to large trees which are always brought down by the floods. The ingenious architect has the toll ſecured to him by the Legiſlature for 100 years.—*ib.*

GRANDE RIVIERE, a ſettlement in a hilly tract of the iſland of St Domingo, 6½ leagues ſouth-weſt of Fort Dauphin, and 4½ leagues N. by E. of St Raphael, in the Spaniſh part of the iſland, N. lat. 19° 34′, W. long. from Paris 74° 30′.—Alſo the name of a ſmall river, in the ſame iſland, which riſes at Limonade, and empties into the ſea at Qr Morin, 5 leagues eaſt of Cape François.—*ib.*

GRAND *Fathers*, ſeveral large detached mountains in the ſouth-eaſt corner of Tenneſſee, in which are the head waters of French, Broad and Cataba rivers.—*ib.*

GRAND *Iſles*, are two large iſlands in Lake Champlain; each about 8 or 10 miles long, and each forms a townſhip belonging to Vermont.—*ib.*

GRAND *Iſland*, at the mouth of Lake Ontario, is within the Britiſh territories, having Roebuck and Foreſt iſlands on the ſouth-weſt, and the Thouſand Iſles on the north-eaſt. It is 20 miles in length, and its greateſt breadth is 4 miles.—*ib.*

GRAND *Iſland*, in Lake Superior, lies on the north ſide of the lake.—*ib.*

GRAND *Iſland*, in Niagara river, is about 6 miles long and 3 broad. The ſouth end is 4 miles north of Fort Erie; and its northern extremity 3 miles ſouth of Fort Sluſher, and nearly 14 ſouth of Niagara fort.—*ib.*

GRAND *Lake*, in the province of New Brunſwick, near the river St John's, is ſaid to be 30 miles in length, 8 or 10 in breadth, and in ſome places 40 fathoms deep.—*ib.*

GRAND MANAN *Iſland*, lies 6 miles S. by S. E. of Campo-Bello Iſland, in the Atlantic Ocean, oppoſite to Paſſamaquoddy Bay, on the eaſtern border of the United States.—*ib.*

GRAND *River* runs a north-weſt courſe into Lake Erie, 20 miles below the Forks, 80 miles ſouth-weſt of Preſque Iſle.—*ib.*

GRANGE, *Cape La*, or *Cape Monte Chriſt*, on the north ſide of the iſland of St Domingo. It is a high hill, in the form of a tent, and may be ſeen by the naked eye at Cape François, from which it is 14 leagues E. by N. A ſtrip of land joins it to the territory of Monte Chriſt; ſo that at a diſtance it ſeems to be an iſland. The cruiſers from Jamaica often lie off here. This cape lies in lat. 19° 54′ 30″ N. and long. 74° 9′ 30″ W. from Paris; and with Point de Dunes forms the mouth of the bay of Monte Chriſt.—*ib.*

GRANVILLE, a fine townſhip in Annapolis county, Nova-Scotia. It lies on the north ſide of Annapolis river, on the Bay of Fundy, and is 30 miles in length; firſt ſettled from New-England.—*ib.*

GRANVILLE, a townſhip in Hampſhire county, Maſſachuſetts, about 14 miles weſt of Springfield. It was incorporated in 1754, and contains 1979 inhabitants.—*ib.*

GRANVILLE, a townſhip in Waſhington county, New-York, containing 2240 inhabitants, of whom 422 are electors.—*ib.*

GRANVILLE *County*, in Hillſborough diſtrict in North-Carolina, has the State of Virginia north, and contains 10,982 inhabitants, of whom 4163 are ſlaves. Chief town, Williamſburg.—*ib.*

GRANVILLE, a flouriſhing town in Kentucky.—*ib.*

GRAVE CREEK, on the Ohio, 12 miles down the river from Wheeling. Here is a mound of earth, plainly the work of art, called an Indian grave. It is of a conical form, in height about 80 feet. It aſcends in an angle of about 80°. The diameter at the top is about 60 feet; the margin encloſing a regular concave, ſunk about 4 feet in the centre. Near the top ſtands an oak, about 3 feet in diameter. It is ſaid the Indians have no tradition what nation ever buried their dead in this manner. On examination, theſe mounds have been found to contain a chalky ſubſtance, ſuppoſed to be bones of the human kind.—*ib.*

GRAVESEND, Port of, is ſituated on the ſouth-weſtern ſide of the iſland of Jamaica, in a large bay. It has two channels; the Leeward and the Main Channel, and affords good anchorage for large veſſels.—*ib.*

Gravesend, a ſmall village in King's county, Long-Iſland, New-York, 7 miles N. by E. of the city. The townſhip of its name contains 426 inhabitants.—*ib.*

GRAVIMETER, the name given by citizen Guyton (Morveau) to an inſtrument of glaſs, conſtructed in all reſpects on the principle of Nicholſon's Hydrometer, deſcribed in the article Hydrostatics, n° 18 (*Encycl.*) It is therefore needleſs to give a deſcription of this inſtrument here; as every artiſt in glaſs, who has ſeen Nicholſon's Hydrometer, or underſtands our deſcription of it, may conſtruct the gravimeter of Morveau; and every man who has made himſelf maſter of our article Specific *Gravity*, may apply the gravimeter to every purpoſe to which it is applicable. It may juſt be proper to obſerve, that Morveau, having at firſt loaded the ſmall ſcale or baſon G (Plate 240, fig. 9. *Encycl.*) with a bulb of glaſs containing a ſufficient quantity of mercury, found it expedient afterwards to ſubſtitute in the place of this bulb a ſmall maſs of ſolid glaſs, brought to the proper form and weight by grinding. For a minute account of this inſtrument, if any of our readers can be ſuppoſed to require a minute account of it, we muſt refer to the third number of Nicholſon's *Journal of Philoſophy, Chemiſtry*, and the *Arts*.

GRAY, a poſt-town in the Diſtrict of Maine, in Cumberland county, 15 miles N. by W. of Portland. The townſhip was incorporated in 1778, and contains 577 inhabitants.—*Morse.*

GREAT BARRINGTON, a townſhip in the ſouth-weſtern part of the State of Maſſachuſetts, in Berkſhire county, lying ſouth of Stockbridge, 150 miles weſt of Boſton, and 26 E. by S. of Hudſon city, New-York.—*ib.*

Great Famine, a river in New-York which riſes in the mountains near the ſource of Oneida river, and flows N. W. by W. to Lake Ontario. Its mouth is 10 miles ſouth-weſterly from the mouth of Black river.—*ib.*

Great Kanhaway, a large river which flows through the eaſtern bank of the Ohio in 39° 5′ N. lat. nearly 500 yards wide at its mouth. The current is gentle for about 10 or 12 miles, when it becomes conſiderably rapid for upwards of 60 miles farther, where you meet with the firſt falls, when it becomes impoſſible to navigate it from the great number of its cataracts.—*ib.*

Great Swamp, between Northampton and Lucern counties, in Pennſylvania. This ſwamp, on examination and ſurvey, is found to be good farm land; thickly covered with beach and ſugar maple.—*ib.*

Great Ridge, one of the ridges of the Alleghany Mountains, which ſeparates the waters of the Savannah and Alatamaha.

At the ſouth-eaſt promontory of the Great Ridge is that extraordinary place called Buffaloe Lick, diſtant about 80 miles from Auguſta. It occupies ſeveral acres of ground. A large cane ſwamp and meadows, forming an immenſe plain, lie ſouth-eaſt from it; in this ſwamp Mr Bartram thinks the branches of the Great Ogeeche take their riſe. The Lick is nearly level, and lies between the head of the cane ſwamp, and the aſcent of the Ridge. The earth, from the ſuperficies to an unknown depth, is an almoſt white or cinerous coloured, tenacious, fattiſh clay, which all kinds of cattle lick into great caves, purſuing the delicious vein. Mr Bartram could not diſcover any thing ſaline in its taſte, but an inſipid ſweetneſs. Horned cattle, horſes, and deer, are immoderately fond of it; inſomuch that their excrement, which almoſt totally covers the earth to ſome diſtance round this place, appears to be perfect clay; which when dried by the ſun and air, is almoſt as hard as brick.—*ib.*

Great Springs, is an amazing fountain of tranſparent, cool water, ſituated near the road, about midway between Auguſta and Savannah. It breaks ſuddenly out of the earth at the baſis of a moderately elevated hill or bank, forming at once a baſon near 20 yards over, aſcending through a horizontal bed of ſoft rocks, chiefly a teſtaceous concretion of broken, entire, and pulverized ſea-ſhells, ſand, &c. conſtituting a coarſe kind of lime-ſtone. The ebullition is copious, active, and continual, over the ragged apertures in the rocks, which lie ſeven or eight feet below, ſwelling the ſurface conſiderably, immediately above it; the waters deſcend ſwiftly from the fountain, forming at once a large brook, ſix or eight yards over, and five or ſix feet deep. There are multitudes of fiſh in the fountain of various tribes; chiefly the ſeveral ſpecies of bream, trout, catfiſh, and garr, which are beheld continually aſcending and deſcending through the rocky apertures. Bartram, from whoſe travels the above is taken, obſerves, that he croſſed no ſtream or brook of water within 12 or 15 miles of this fountain, but had in view vaſt ſavannahs, ſwamps, and cane meadows, which he conjectures are the reſervoirs which feed this delightful grotto.—*ib.*

GREEN, though one of the ſeven original or priſmatic colours, is among dyers a compound of blue and yellow. Of the European methods of dyeing green, and of the principles on which theſe methods are founded, a ſufficient account will be found in the *Encyclopædia*, under the articles Colour-*making* and Dyeing, and, in this *Supplement*, under *Animal and Vegetable* Substances; but it may be worth while, in this place, to inſert the method practiſed at Aſtracan, in giving to cotton yarn that beautiful green colour for which the oriental cotton is ſo juſtly admired.

The principal dye is the blue, which is employed both for cotton and ſilk. To prepare it, the indigo or blue dye-ſtuff is finely pounded, and diſſolved in water by a gentle heat in large earthen jars, ſeven of which ſtand in brick-work over the fire-place, at the diſtance of about an ell and a half from each other. About two pounds are put into each veſſel. Five pounds of ſoda finely pounded, together with two pounds of pure lime and one pound of clarified honey, are added to each; when theſe ingredients have been well mixed, the fire is ſtrengthened; and when the whole begins to boil, the dye is ſtirred carefully round in all the veſſels, that every thing may be completely diſſolved and mixed. After the firſt boiling the fire is ſlackened, and the dye is ſuffered to ſtand over a gentle heat, while it is continually ſtirred round: this is continued even after the furnace is cooled, till a thick ſcum ariſes in the neck of each jar, and ſoon after diſappears. The dye is then allowed to ſtand two days, until the whole is incorporated, and the dye thickens.

The dyers aſſert, that with this dye they can produce three ſhades of blue, and that, as the dyeing particles gradually diminiſh, they can die alſo a green colour by the addition of yellow.

When a manufacturer gives cotton yarn to a blue dyer, he firſt boils it at home in a ley of ſoda *(kalakar)*, then dries it, waſhes it, and dries it again. The blue dyer lays this yarn to ſteep in pure water, preſſes out the ſuperfluous water with the hands, and then immediately begins to dip it in the blue jar, often wringing it till it is completely penetrated by the dye. This firſt tint is generally given to yarn in ſuch jars as have had their colouring matter partly exhauſted. It is then dried, rinſed, and again dried: after which, it is put into the freſh blue dye, properly ſaturated; and, after the colour has been ſufficiently heightened, it is dried for the laſt time.

For a yellow dye, the dyers of Aſtracan employ partly ſaw-wort, brought from Ruſſia, and partly the leaves of the *kiſlar belge*, or *ſumach*. The proceſs is as follows: The yarn is firſt boiled for an hour in a ſtrong ley of ſoda; it is then dried, afterwards rinſed and laid wet to ſteep for twelve hours in a ſolution of alum with warm water. When it has been dried in the air, it is laid to ſoak ſeveral times in troughs with the dye which has been boiled thick in kettles from the above-mentioned plants, till it has acquired the wiſhed-for colour, care being taken to dry it each time it is ſoaked. It is then rinſed in running water, and dried for the laſt time.

On this yellow colour a green is often dyed. After the yarn has been dyed yellow, it is given out to the blue dyer, who immediately dips it in the blue jars, the dye of which has been already partly exhauſted: and if the green colour is not then ſufficiently high, the operation is repeated, the yarn being dried each time. See *Neue Nordiſche Beytrage*, by Profeſſor Pallas; or *Philoſophical Magazine*, n° 2.

GREEN, a townſhip in Franklin county, Pennſylvania.—Alſo a townſhip in Waſhington county in the ſame State.—*Morſe.*

GREEN, a poſt-town in Lincoln county, in the Diſtrict of Maine, ſituated on the eaſt ſide of Androſcoggin river, 31 miles W. by S. of Pittſton, 39 north of Portland, and 164 N. by E. of Boſton, containing 639 inhabitants.—*ib.*

GREEN, a navigable river of Kentucky, which riſes in Mercer county, has a gentle current, and is navigable nearly 150 miles. Its courſe is generally weſt; and at its confluence with the Ohio is upwards of 200 yards wide. Between the mouth of Green river and Salt river, a diſtance of nearly 200 miles, the land upon the banks of the Ohio is generally fertile and rich; but, leaving its banks, you fall into the plain country, which is conſidered as little better than barren land. On this river are a number of Salt ſprings or licks. There are three ſprings or ponds of bitumen near this river, which do not form a ſtream, but empty themſelves into a common reſervoir, and when uſed in lamps, anſwers all the purpoſes of the beſt oil. Vaſt quantities of nitre are found in the caves on its banks; and many of the ſettlers manufacture their own gunpowder.—*ib.*

GREEN BAY, or *Puan Bay*, a ſouth-weſtern branch of Lake Michigan.—*ib.*

GREEN, a ſmall river which riſes in the town of Marlborough in Vermont, and falls into Connecticut river above Deerfield, in Maſſachuſetts.—*ib.*

GREEN BRIAR, a large and fertile county of Virginia, ſurrounded by Bath, Randolph, Harriſon, Kanhaway, Botetourt, and Montgomery counties. It is about 100 miles long and 45 broad; and together with Kanhaway county, which was formerly a part of it, contains 6,015 inhabitants, including 319 ſlaves. There is a large cave on Rich Creek in this county, the earth at the bottom of which is ſtrongly impregnated with ſulphur. Many ſuch are to be found on Green Briar river. The chief town is Lewiſburg. At *Green Briar* court-houſe is a poſt-office, 30 miles W. by S. of Sweet Springs, and 103 weſt of Staunton.—*ib.*

GREEN BRIAR *River* runs a S. W. courſe, and falls into the eaſtern ſide of the Great Kanhaway, at the place where that river breaks through the Laurel Ridge, and oppoſite to the mouth of New river, in N. lat. 38.—*ib.*

GREEN MOUNTAINS, a range of mountains extending N. N. E. to S. S. W. and dividing the waters which flow eaſterly into Connecticut river, from thoſe which fall weſterly into Lake Champlain, Lake George, and Hudſon's river. The aſcent from the eaſt to the top of the Green Mountain in Vermont, is much eaſier than from the weſt, till you get to Onion river, where the mountain terminates. The height of land is generally from 20 to 30 miles from the river, and about the ſame diſtance from the New-York line. The natural growth upon this mountain, is hemlock, pine, ſpruce, and other evergreens; hence it has always a green appearance, and on this account has obtained the deſcriptive name of *Ver Mons*, Green Mountain. On ſome parts of this mountain ſnow lies till May, and ſometimes till June. The chain extends through Maſſachuſetts and Connecticut, and terminates in New-Haven. Kellington Peak, the higheſt of theſe mountains, is about 3,454 feet above the level of the ocean.—*ib.*

GREEN *Woods*, a vaſt foreſt of ſtately pines in Litchfield county, Connecticut, which cover the face of a part of that county. Theſe are cloathed in green bearded moſs, which being pendant from the boughs, ſcreens many of the trees from the eyes, and gives to the whole a gloomy, wild, and whimſical appearance.—*ib.*

GREENBURGH, a townſhip in Weſtcheſter county, New-York, containing 1400 inhabitants, of whom 122 are ſlaves, and 164 are electors.—*ib.*

GREENCASTLE, a town in Franklin county, Pennſylvania, ſituated near the Conegocheague creek. Here are about 80 houſes, 2 German churches, and a Preſbyterian church. It is 11 miles S. by W. of Chamberſburg, and 156 W. by S. of Philadelphia.—*ib.*

Greene, a county in Kentucky, extending from Ohio river on the north, to Tenneſſee State on the ſouth, and bordering weſt on the Miſſiſſippi river, and eaſt upon Hardin and Jefferſon counties.—*ib.*

Greene, a county in Waſhington diſtrict in the State of Tenneſſee, having 7,741 inhabitants, of whom 454 are ſlaves. Greenville college has been eſtabliſhed by law in this county. It is ſituated between two ſmall northern branches of Nolachucky river, about 15 miles N. W. by W. of Joneſborough, and 54 eaſt of the mouth of French Broad river.—*ib.*

Greene, a townſhip in Tioga county, New-York, on the eaſt ſide of Chenengo river.—*ib.*

Greene, a county in the upper diſtrict of Georgia, bounded weſt by the upper part of Oconee river, eaſt by Wilkes county, and ſouth by that of Waſhington. It contains 5,405 inhabitants, including 1,377 ſlaves. Chief town, Greenſborough.—*ib.*

GREENEVILLE, a poſt-town, and the chief town of Pitt county, North-Carolina; ſituated on the ſouth bank of Tar river, diſtant from Ocreecok Inlet 110 miles. It contains about 50 houſes, a court-houſe and gaol; alſo a ſeminary of learning, called the Pitt Academy. It is 23 miles from Waſhington and 25 miles from Tarborough.—*ib.*

Greeneville, a ſmall poſt-town in Greene county, in the State of Tenneſſee, ſituated on the weſt ſide of the north-eaſternmoſt branch of Nolachucky river, about ſix miles N. by E. of Greenville college, 26 miles north-weſt of Joneſborough, 75 eaſt of Knoxville, and 653 ſouth-weſt of Philadelphia.—*ib.*

GREENFIELD, a handſome flouriſhing town in Hampſhire county, Maſſachuſetts, about 4 miles north of Deerfield, and 114 W. by N. of Boſton. The townſhip lies on the weſt bank of Connecticut river, was incorporated in 1753, and contains 1,498 inhabitants. A company was incorporated in 1796 to build a bridge over Connecticut river, to connect this town with Montague.—*ib.*

Greenfield, a townſhip in Saratoga county, New-York; 380 of the inhabitants are electors.—*ib.*

GREENLAND, a town in Rockingham county, New-Hampſhire, in the vicinity of the ocean, 5 miles ſoutherly from Portſmouth. It was incorporated in 1713, and contains 634 inhabitants.—*ib.*

GREENSBOROUGH, a poſt-town, and chief town of Greene county, Georgia, 30 miles from Lexington, and 78 W. by S. from Auguſta.—*ib.*

Greensborough, a thriving village in Caroline county, Maryland; on the weſt ſide of Choptank Creek, about ſeven miles north of Danton, and 22 miles S. E. by S. of Cheſter.—*ib.*

Greensborough, a new townſhip in Orleans county in Vermont. It adjoins to Minden on the north-weſt, and Wheelock on the ſouth-eaſt, and contains only 19 inhabitants.—*ib.*

GREENSBURG, a poſt-town, and the capital of Weſtmoreland county, Pennſylvania. It is a neat pretty town, ſituated on a branch of Sewickly Creek, which empties into Youghiogany river. Here are 100 dwelling houſes, a German Calviniſt church, a brick court-houſe, and a ſtone gaol. It is 31 miles S. E. by E. of Pittſburg, and 270 W. by N. of Philadelphia.—*ib.*

GREENSVILLE, a county of Virginia, encompaſſed by Brunſwick, Southampton, and Suſſex counties, on the weſt, north, and eaſt, and by the State of North-Carolina on the ſouth. It is about 24 miles long, and 20 broad, and contains 6,362 inhabitants, of whom 3,620 are ſlaves.—*ib.*

GREENVILLE *Court-Houſe*, in Virginia, ſtands on Kick's Ford, 25 miles from Southampton, and 61 from Norfolk.—*ib.*

Greenville, a county in Waſhington diſtrict, S. Carolina; ſituated in the N. W. corner of the State; bounded eaſt by Spartanburg county, in Pinckney diſtrict; ſouth, by Pendleton; weſt, by the State of Georgia, and that tract of country which the State of South-Carolina ceded to the United States; and north, by the State of North Carolina. It contains 6,503 inhabitants, of whom 606 are ſlaves. Taxes £192 : 6 : 8. The lands are mountainous and hilly, and well watered, and the climate healthy and agreeable.—*ib.*

Greenville, a poſt-town of South-Carolina, and chief town of Cheraws diſtrict; ſituated on the weſt ſide of Great Pedee river, in Darlington county. It contains about 30 houſes, a court-houſe, gaol, and academy. It is 55 miles E. N. E. of Camden, 90 N. E. by E. of Columbia, 135 N. by E. of Charleſton.—*ib.*

Greenville, a fort and ſettlement in the N. W. Territory, on the ſouth ſide of a north-weſtern branch of the Great Miami, ſix miles north-weſt of Fort Jefferſon on the ſame branch, and about 23 miles ſouth-eaſt of Fort Recovery. It is a picketed fort, with baſtions at each angle, and capacious enough to accommodate 2,000 men. Here the American legion had their head-quarters in the late war with the Indians. It was eſtabliſhed by the late Maj. Gen. A. Wayne in 1793, and here he concluded a treaty of peace with the Indian nations, on the 3d of Auguſt, 1795.—*ib.*

Greenville Bay, or *La Bay*, a town and port of entry on the eaſt or windward ſide of the iſland of Granada. It has about 60 dwelling-houſes, a church, and ſeveral rich ſtores of India and European goods, and plantation utenſils. The ſituation is low, and rather unhealthy.—*ib.*

GREENWICH, a townſhip in Hampſhire county, Maſſachuſetts, incorporated in 1754, contains 1045 inhabitants. It is 20 miles eaſterly of Northampton, and 75 weſterly of Boſton.—*ib.*

Greenwich, a townſhip, the ſecond in rank in Glouceſter county, New-Jerſey, ſituated on the eaſt bank of Delaware river, oppoſite to Fort Mifflin, 3 miles N. by E. of Woodbury, and 6 ſouth-eaſt of Philadelphia.—*ib.*

Greenwich, a townſhip in Suſſex county, New-Jerſey, on the eaſt ſide of Delaware river, in a mountainous country, about 5 miles north-eaſterly of Eaſton, in Pennſylvania, and 31 ſouth-weſt of Newton, the ſhire town. It contains 2,035 inhabitants, of whom 64 are ſlaves.—*ib.*

Greenwich, a town in Cumberland county, New-Jerſey, on the north-weſt bank of Cohanzy creek, about 3 miles from its mouth in Delaware bay. Here are about 80 houſes, and a Friend's meeting-houſe. It is 15 miles ſouth-eaſterly of Salem, and 66 S. by W. of Philadelphia.—*ib.*

Greenwich, a maritime townſhip in Fairfield county, Connecticut, and the ſouth-weſternmoſt of the State, lies about 50 miles weſt of New-Haven, and 40 eaſt of New-York city. Its ſea-coaſt on Long Iſland Sound, and that of the townſhip of Stamford on the eaſtward, has a number of iſles and rocks bordering the inlets of the ſea and mouths of the creeks. Byram river paſſes through this town, the largeſt of the ſmall ſtreams which water it, and only noticeable as forming part of the line between Connecticut and New-York.

This tract was purchaſed of the native Indians in 1640, and ſettled under the government of the New Netherlands (now New-York) and was incorporated by Peter Stuyveſant in 1665, who was then governor of the New Netherlands. This town falling within the bounds of Connecticut, was afterwards granted to eight perſons by that colony.—*ib.*

GREENWOOD, a townſhip in Cumberland county, Pennſylvania. Alſo, a townſhip in Mifflin county in the ſame State.—*ib.*

GREGORIA, St, a town of New-Mexico, ſituated on the eaſt ſide of Rio Bravo, a few leagues north of St Antonio.—*ib.*

GREGORY (David), was a ſon of the Rev. John Gregory, miniſter of Drumoak, in the county of Aberdeen, and elder brother to Mr James Gregory, the inventor of the moſt common reflecting teleſcope. He was born about the year 1627 or 1628; and though he poſſeſſed all the genius of the other branches of his family, he was educated by his father for trade, and ſerved an apprenticeſhip to a mercantile houſe in Holland. Having a ſtronger paſſion, however, for knowledge than for money, he abandoned trade in 1655; and returning to his own country, he ſucceeded, upon the death of an elder brother, to the eſtate of Kinardie, ſituated about forty miles north from Aberdeen, where he lived many years, and where thirty-two children were born to him by two wives. Of theſe, three ſons made a conſpicuous figure in the republic of letters, being all profeſſors of mathematics at the ſame time in three of the Britiſh univerſities, viz. David at Oxford, James at Edinburgh, and Charles at St Andrews.

Mr Gregory, the ſubject of this memoir, while he lived at Kinardie, was a jeſt among the neighbouring gentlemen for his ignorance of what was doing about his own farm, but an oracle in matters of learning and philoſophy, and particularly in medicine, which he had ſtudied for his amuſement, and began to practiſe among his poor neighbours. He acquired ſuch a reputation in that ſcience, that he was employed by the nobility and gentlemen of that county, but took no fees. His hours of ſtudy were ſingular. Being much occupied through the day with thoſe who applied to him as a phyſician, he went early to bed, roſe about two or three in the morning, and, after applying to his ſtudies for ſome hours, went to bed again and ſlept an hour or two before breakfaſt.

He was the firſt man in that country who had a barometer; and having paid great attention to the changes in it, and the correſponding changes in the weather, he was once in danger of being tried by the preſbytery for witchcraft or conjuration. A deputation of that body waited upon him to enquire into the ground of certain reports that had come to their ears; but he ſatisfied them ſo far as to prevent the proſecution of a man known to be ſo extenſively uſeful by his knowledge of medicine.

About the beginning of this century he removed with his family to Aberdeen, and in the time of Queen Anne's war employed his thoughts upon an improvement in artillery, in order to make the ſhot of great guns more deſtructive to the enemy, and executed a model of the engine he had conceived. Dr Reid informs us, that he converſed with a clock-maker in Aberdeen who had been employed in making this model; but having made many different pieces by direction without knowing their intention, or how they were to be put together, he could give no account of the whole. After making ſome experiments with this model, which ſatisfied him, the old gentleman was ſo ſanguine in the hope of being uſeful to the allies in the war againſt France, that he ſet about preparing a field equipage with a view to make a campaign in Flanders, and in the mean time ſent his model to his ſon the Savilian profeſſor, that he might have his and Sir Iſaac Newton's opinion of it. His ſon ſhewed it to Newton, without letting him know that his own father was the inventor. Sir Iſaac was much diſpleaſed with it, ſaying, that if it had tended as much to the preſervation of mankind as to their deſtruction, the inventor would have deſerved a great reward; but as it was contrived ſolely for deſtruction, and would ſoon be known by the enemy, he rather deſerved to be puniſhed, and urged the profeſſor very ſtrongly to deſtroy it, and if poſſible to ſuppreſs the invention. It is probable the profeſſor followed this advice. He died ſoon after, and the model was never found.

If this be a juſt account of the matter, and Dr Reid's veracity is unqueſtionable, we cannot help thinking that Newton's uſual ſagacity had, on that occaſion, forſaken him. Were the implements of war much more deſtructive than they are, it by no means follows that more men would be killed in battle than at preſent. Muſkets and cannons are ſurely more deſtructive weapons than javelines and bows and arrows; and yet, it is a well known fact, that ſince the invention of gunpowder, battles are not half ſo bloody as they were before that period. The oppoſite armies now ſeldom come to cloſe quarters, a few rounds of muſketry and artillery commonly decide the fate of the day; and had Mr Gregory's improvement been carried into effect, ſtill fewer rounds would have decided it than at preſent, and the carnage would conſequently have been leſs.

When the rebellion broke out in 1715, the old gentleman went a ſecond time to Holland, and returned when it was over to Aberdeen, where he died about 1720, aged 93, leaving behind him a hiſtory of his own time and country, which was never publiſhed.

Gregory (Dr David). In addition to the account given in the *Encyclopædia* of this eminent mathematician, it may be proper to add, that he was a moſt intimate and confidential friend of Sir Iſaac Newton, and was intruſted with a manuſcript copy of the *Principia*, for the purpoſe of making obſervations on it. Of theſe Newton availed himſelf in the ſecond edition, they having come too late for his firſt publication, which was exceedingly hurried by Dr Halley, from fears that Newton's backwardneſs would not let it appear at all. There is a complete copy of theſe obſervations preſerved in the library of the univerſity of Edinburgh, preſented to it by Dr James Gregory, the preſent profeſſor of the practice of medicine. Theſe contain many ſublime mathematical diſcuſſions, many valuable commentaries on the *Principia*, and many intereſting anecdotes. There are in it ſome paragraphs in the hand writing of Huyghens relative to his Theory of Light. It would appear that this work of confidential friendſhip was the foundation of that ſyſtem of phyſical and mathematical aſtronomy which has raiſed Dr Gregory to great eminence in the republic of letters.

GREGSTOWN, a village in Somerſet county, New-Jerſey, on the eaſt ſide of Millſtone river, 6 miles north-eaſterly of Princeton, and about 9 ſouth-weſt of New-Brunſwick.—*Morſe.*

GRES, Cape au, a promontory on the eaſtern ſide of the Miſſiſſippi in the N. W. Territory, 8 leagues above the Illinois river, and the tract of country ſo called extends 5 leagues on that river. There is a a gradual deſcent back to delightful meadows, and to beautiful and fertile uplands, watered by ſeveral rivulets, which fall into the Illinois river, between 30 and 40 miles from its entrance into the Miſſiſſippi, and into the latter at Cape au Gres. The diſtance from the Miſſiſſippi to the Illinois acroſs the country, is leſſened or increaſed, according to the windings of the former river; the ſmalleſt diſtance is at Cape au Gres, and there it is between 4 and 5 miles. The lands in this intermediate ſpace between the above two rivers are rich, almoſt beyond parallel, covered with large oaks, walnut, &c. and not a ſtone to be ſeen, except upon the ſides of the river.

If ſettlements were begun here, the French inhabitants acknowledge that the Spaniſh ſettlements on the other ſide of the Miſſiſſippi would be abandoned; as the former would excite a conſtant ſucceſſion of ſettlers, and intercept all the trade of the upper Miſſiſſippi.—*ib.*

GRINDING in Cutlery, a well known operation, by which edge-tools are ſharpened. As commonly practiſed, the grinding of tools is attended with great inconveniency ariſing from the production or developement of heat by friction. The fact of ſparks flying from a dry grindſtone when a piece of iron or ſteel is applied to its ſurface during the rotation, has been ſeen by every one. The heat produced during this proceſs is ſuch that the ſteel very ſoon becomes ignited, and hard tools are very frequently ſoftened and ſpoiled, for want of care during the grinding. When a cylindrical ſtone is partly immerſed in a trough of water, the rotation muſt be moderate and the work ſlow, otherwiſe the water would ſoon be thrown off by the centrifugal force; and when this fluid is applied by a cock from above, the quantity is too ſmall to preſerve the requiſite low temperature. It is even found, that the point of a hard tool, ground under a conſiderable maſs of water, will be ſoftened, if it be not held ſo as to meet the ſtream; ſparks being frequently afforded even under the water.

To find a remedy for this, Mr Nicholſon was led, by ſome accounts which he received of German cutlery, to make the following experiment. He procured a Newcaſtle grindſtone of a fine grit and ten inches in diameter, and alſo a block of mahogany to be uſed with emery on its face. Both the ſtone and the wooden block were mounted on an axis, to be occaſionally applied between the centres of a ſtrong lathe. In this ſituation both were turned truly cylindrical, and of the ſame diameter. The face of the wood was grooved obliquely in oppoſite directions, to afford a lodgement for the emery. The face of the ſtone was left ſmooth, and there was a trough of proper ſize applied beneath the ſtone to hold water. The grindſtone was then uſed with water, and the wooden cylinder was faced with emery and oil. The inſtrument ground was a file, out of which it was propoſed to grind all the teeth. The rotation was produced by the mechaniſm of the lathe; the velocity being ſuch as to turn the grinding apparatus about five revolutions in a ſecond. The ſtone operated but ſlowly, and the water from the trough was ſoon exhauſted, with inconvenience to the workman, who could ſcarcely be defended from it but by ſlackening the velocity. The emery cylinder cut rather faſter. But notwithſtanding the friction was made to operate ſucceſſively and by quick changes on the whole ſurface of the file, it ſoon became too much heated to be held with any convenience; and when a cloth was uſed to defend the hand, the work not only became awkward, but the heat increaſed to ſuch a degree that the oil began to be decompoſed, and emitted an empyreumatic ſmell. The ſtone was then ſuffered to dry, and the file tried upon its face. It almoſt immediately became blue, and ſoon afterwards red hot. Both the cylinders were then covered with tallow, by applying the end of a candle to each while revolving, and emery was ſprinkled upon the cylinder of wood. The ſame tool was then applied to the grindſtone in rapid motion. At the firſt inſtant the friction was ſcarcely perceptible; but very ſpeedily afterwards the zone of tallow preſſed by the tool became fuſed, and the ſtone cut very faſt. The tool was ſcarcely at all heated for a long time; and when it began to feel warm, its temperature was immediately lowered by removing it to a new zone of the cylinder. The ſame effect took place when the experiment was repeated with the wooden cylinder.

It is not difficult to explain this by the modern doctrine of heat. When oil was uſed upon the wooden cylinder, the heat developed by the friction was employed in raiſing the temperature of the tool and of the fluid oil: but when tallow was ſubſtituted inſtead of the oil, the greateſt part of the heat was employed in fuſing this conſiſtent body. From the increaſed capacity of the tallow, when melted, this heat was abſorbed, and became latent, inſtead of being employed to raiſe the temperature: and whenever, by continuing the proceſs, the tallow already melted began to grow hot, together with the tool, it was eaſy to reduce the temperature again by employing the heat on another zone of conſiſtent tallow. He uſed theſe two cylinders, with much ſatisfaction, in a conſiderable quantity of work.

This promiſes to be a valuable diſcovery; and the public is obliged to the ingenious author of the Philoſophical Journal for being at ſo much pains on this, as well as on other occaſions, to render his ſcience ſubſervient to the uſeful arts.

Groſe ‖ Groton.

Groſe. GROSE (Francis Eſq; F.A.S.) was born, we believe, in 1731. He was the ſon of Mr Francis Groſe of Richmond, jeweller, who filled up the coronation crown of George II. and died 1769. By his father he was left an independent fortune, which he was not of a diſpoſition to add to, or even to preſerve. He early entered into the Surrey militia, of which he became adjutant and paymaſter; but ſo much had diſſipation taken poſſeſſion of him, that in a ſituation which above all others required attention, he was ſo careleſs as to have for ſome time (as he uſed pleaſantly to tell) only two books of accounts, viz. his right and left hand pockets. In the one he received, and from the other paid; and this too with a want of circumſpection which may be readily ſuppoſed from ſuch a mode of book-keeping. His loſſes on this occaſion rouſed his latent talents. With a good claſſical education he united a fine taſte for drawing; and encouraged by his friends, as well as prompted by his ſituation, he undertook the work from which he derived both profit and reputation; we mean, his Views of Antiquities in England and Wales, which he firſt began to publiſh in numbers in the year 1773, and finiſhed in the year 1776. The next year he added two more volumes to his Engliſh Views, in which he included the iſlands of Guernſey and Jerſey, which were completed in 1787. This work anſwered his moſt ſanguine expectations; and, from the time he began it to the end of his life, he continued without intermiſſion to publiſh various works (a liſt of which we ſubjoin), generally to the advantage of his literary reputation, and almoſt always to the benefit of his finances. His wit and good humour were the abundant ſource of ſatiſfaction to himſelf, and entertainment to his friends. He viſited almoſt every part of the kingdom, and was well received wherever he went. In the ſummer of 1789 he ſet out on a tour in Scotland; the reſult of which he began to communicate to the public in 1790 in numbers. Before he had concluded this work, he proceeded to Ireland, intending to furniſh that kingdom with views and deſcriptions of her antiquities, in the ſame manner he had executed thoſe of Great Britain; but ſoon after his arrival in Dublin, being at the houſe of Mr Home there, he ſuddenly was ſeized at table with an apoplectic fit, on the 6th of May, 1791, and died immediately. He was interred in Dublin.

"His literary hiſtory (ſays a friend), reſpectable as it is, was exceeded by his good humour, conviviality, and friendſhip. Living much abroad, and in the beſt company at home, he had the eaſieſt habits of adapting himſelf to all tempers; and, being a man of general knowledge, perpetually drew out ſome converſation that was either uſeful to himſelf, or agreeable to the party. He could obſerve upon moſt things with preciſion and judgment; but his natural tendency was to humour, in which he excelled both by the ſelection of anecdotes, and his manner of telling them: it may be ſaid, too, that his figure rather aſſiſted him, which was in fact the very title page to a joke. He had neither the pride nor malignity of authorſhip; he felt the independency of his own talents, and was ſatisfied with them without degrading others. His friendſhips were of the ſame caſt; conſtant and ſincere, overlooking ſome faults, and ſeeking out greater virtues. He had a good heart; and, abating thoſe little indiſcretions natural to moſt men, could do no wrong."

He married at Canterbury, and reſided there ſome years, much beloved and reſpected for his wit and vivacity; "which (another friend obſerves), though he poſſeſſed in an extreme degree, was but little tinctured with the cauſtic ſpirit ſo prevalent among ſpirits of that claſs. His humour was of that nature which exhilarates and enlivens, without leaving behind it a ſting; and though perhaps none poſſeſſed more than himſelf the faculty of "ſetting the table in a roar," it was never at the expence of virtue or good manners. Of him, indeed, may be ſaid in the words of Shakeſpeare,

——— a merrier man,
Within the limits of becoming mirth,
I never ſpent an hour's talk withal:
His eye begets occaſion for his wit;
And every object that the one doth catch,
The other turns to a mirth-moving jeſt.

"Of the moſt careleſs, open, and artleſs diſpoſition, he was often (particularly in the early part of his life) the prey of the deſigning; and has more than once (it is believed) embarraſſed himſelf by too implicit confidence in the probity of others. A tale of diſtreſs never failed to draw commiſeration from his heart; and often has the tear been diſcovered gliding down that cheek which a moment before was fluſhed with jocularity."

He was father of Daniel Groſe, Eſq; captain of the royal regiment of artillery (who, after ſeveral campaigns in America, was appointed in 1790 deputy governor of the new ſettlement at Botany Bay), and ſome other children.

His works are as follow:

1. The Antiquities of England and Wales, 8 vols. 4to and 8vo. 2. The Antiquities of Scotland, 2 vols. 4to and 8vo. 3. The Antiquities of Ireland, 2 vols. 4to and 8vo. 4. A Treatiſe on ancient Armour and Weapons, 4to, 1785. 5. A Claſſical Dictionary of the Vulgar Tongue, 8vo, 1785. 6. Military Antiquities; being a Hiſtory of the Engliſh Army from the Conqueſt to the preſent time, 2 vols 4to, 1786, 1788. 7. The Hiſtory of Dover Caſtle, by the Rev. William Danell, 4to, 1786. 8. A Provincial Gloſſary, with a Collection of local Proverbs and popular Superſtitions, 8vo, 1788. 9. Rules for drawing Caricatures, 8vo, 1788. 10. Supplement to the Treatiſe on Ancient Armour and Weapons, 4to, 1789. 11. A Guide to Health, Beauty, Honour, and Riches; being a collection of humourous Advertiſements, pointing out the means to obtain theſe bleſſings; with a ſuitable introductory Preface, 8vo. 12. The Olio; being a Collection of Eſſays in 8vo, 1793.

GROS MORNE ſtands in the middle of the north peninſula of the iſland of St Domingo, between the mountain and the head waters of a river which falls into the ſea 4 leagues to the north, and a league and a half weſt of Port de Paix. It is equally diſtant, 11 leagues north-eaſt of Point Paradis, and north-weſt of Les Gonaives. N. lat. 19° 46′, W. long. from Paris 75° 13′.—*Morse.*

GROTON, a townſhip in Caledonia county, in Vermont, is ſituated weſtward of and adjoining to

Ryegate townſhip on Connecticut river, and 9 miles north-weſterly of Stephen's Fort on that river. It contains 45 inhabitants.—*ib.*

Groton, a townſhip in Middleſex county, Maſſachuſetts, 35 miles N. W. of Boſton, and contains 1,840 inhabitants.—*ib.*

Groton, a townſhip in New-London county, Connecticut, having Fiſher's Iſland Sound on the ſouthward, and Thames river on the weſt; which ſeparates it from New-London, to which it formerly belonged. It was incorporated in 1705, and conſiſts of two pariſhes, containing 3,946 inhabitants. In 1770 there were 140 Indians here; 44 of whom could read, and 17 were church members. On a height, on the bank of the Thames, oppoſite New-London city, ſtood Fort Griſwold, memorable for being ſtormed on the 6th of September, 1781, by Benedict Arnold, a native of Connecticut, after he had become a traitor to his country. Here 70 men, the flower of the town, were put to the ſword, after they had ſurrendered themſelves priſoners. The compact part of the town was burnt at the ſame time, and ſuſtained loſſes to the amount of £23,217. Fort Griſwold defends the harbour of New-London.—*ib.*

GROVE *Point* forms the north ſide of the mouth of Saſſafras river, in Cheſapeak Bay, 5 miles ſouth-ſouth-weſt of Turkey Point.—*ib.*

GROVET's *Creek*, in the State of Tenneſſee, lies 7 miles from King's Spring, and 2 from the foot of Cumberland Mountain.—*ib.*

GRYALVA, a river in the province of Chiapa, in New Spain, which is ſaid to breed certain amphibious beaſts not to be found in any other place. They reſemble monkeys, and are ſpotted like tygers; they hide themſelves generally under water, and if they ſee any man or beaſt ſwim by, they twiſt their tails about a leg or arm to draw them to the bottom; and yet it has never been obſerved that they eat them.—*ib.*

GRYSON, a new county of Virginia, taken from Montgomery, which bounds it on the north. It has the State of N. Carolina, ſouth, Henry and Wythe counties on the eaſt and weſt.—*ib.*

GUACANA, a village in New Spain, near the mountain Jeruyo, which was deſtroyed by a volcano in that mountain, in 1760.—*ib.*

GUADALAJARRA, or *Guadalaxara*, a province in the audience of Galicia, in Old Mexico or New Spain, and its capital, an epiſcopal city of the ſame name, both large and beautiful. The city was built anno 1531, by one of the family of the Guzmans; and the biſhopric, which was before ſettled at Compoſtella, was tranſlated thither in 1570. It is ſituated on a delightful and fertile plain, watered with ſeveral ſtreams and fountains, not far from Baranja river. The air of the country is temperate, and the ſoil ſo fertile, that it yields 100 to one; and all the fruits of Europe grow in luxuriance and abundance. N. lat. 20° 50′, W. long. 104° 49′. The province is watered by the Guadalaxara river.—*ib.*

GUADALAXARA, or *Great River*, in Mexico or New Spain, riſes in the mountains of the valley of Toloccan, where ſtands the city of Guadalajarra, or Guadalaxara, the capital of New Galicia. After running a courſe of more than 600 miles, it empties into the Pacific Ocean, in the 22d degree of N. lat. It has ſtupendous falls, 15 miles ſouth of the city of its name.—*ib.*

GUAIRA, a Spaniſh province in the eaſt diviſion of Paraguay, in S. America. Its city is Cividad Real, called alſo Guaira, and Oliveros.—*ib.*

GUAMALIES, a province in the juriſdiction of the archbiſhop of Lima, in S. America, and empire of Peru, begins 80 leagues north-eaſt of Lima, and extends along the centre of the Cordillera. The Indian inhabitants apply themſelves to weaving, and making a great variety of baizes, ſerges, and other ſtuffs, with which they carry on conſiderable trade with the other provinces.—*ib.*

GUAMAN VILLAS, a juriſdiction under the archbiſhop of Lima, 7 leagues from Guamanga. It is highly fertile, abounding with corn, fruits, paſtures, cattle in great quantities, and all manner of eſculent vegetables. The Indians here are equally induſtrious as thoſe above mentioned, making baizes, corded ſtuffs, &c. which they ſend to Cuſco and other provinces.—*ib.*

GUAMANGA, or *Guamanca*, or *St Juan de la Vittoria*, a city of Peru, about 60 leagues ſouth-eaſt of Lima, and having Piſco between it and the ſea. It was founded by Pizarro, in 1539. The houſes are all of ſtone, covered with ſlates. There are in it 3 elegant churches, ſeveral convents, and a rich hoſpital; being the ſeat of a biſhop, under the archbiſhop of Lima, the ſeat of a governor, and the capital of a ſmall province. The air is wholeſome and temperate. The ſoil produces wheat, and the meadows breed numerous herds of cattle. There are in the province mines of gold, ſilver, iron, lead, copper, and ſulphur. The famous quick-ſilver mines of Guancavelica are 9 or 10 leagues from this city. S. lat. 12° 20′, W. long. 72° 36′.—*ib.*

GUANA PATINA, a volcano near Arequipa, in the valley of Quilea, in S. America, and empire of Peru; whoſe eruption, aſſiſted by an earthquake, laid Arequipa in ruins in 1600.—*ib.*

GUANCHA BELICA, a juriſdiction ſubject to the archbiſhop of Lima, in Peru, 30 leagues north of the city of Guamanga; has very rich quick-ſilver mines, but otherwiſe very barren.—*ib.*

GUANCHACO, a port or harbour in Peru, S. America, about 2 leagues north of Truxillo, and the channel of its maritime commerce, ſituated in 8° 6′ S. lat. in the South Sea.—*ib.*

GUANTA, a juriſdiction north-north-weſt of Guamanga 4 leagues, in the empire of Peru; under the archbiſhop of Lima. Its rich ſilver mines are nearly exhauſted.—*ib.*

GUANZAVELICA, or *Guancavelica*, a town of Peru in South-America, and in the audience of Lima. It is rich and abounds in mines of quick-ſilver; 120 miles north-eaſt of Piſco, and 175 ſouth-eaſt of Lima. S. lat. 13°, W. long. 88° 30′. The famous quick-ſilver mines called *Guanzavelica*, or *El Aſſiento de Oropeſo*, not far from the above town, near the city of Oropeſo, were diſcovered by the Spaniards in 1566, and produce annually a million pounds of quick-ſilver, which is tranſported by land to Lima, afterwards to Arica, and thence to Potoſi, where they make uſe of it to melt and refine the ſilver; and it yields to the Spaniſh treaſury 40,000 ducats a year, beſides other emoluments. The quick-ſilver is found in a whitiſh maſs reſembling brick half burned. This ſubſtance is volatilized by fire, and received in ſteam by a combination of glaſs veſſels, where it condenſes by means of a little water at the bottom of each veſſel, and forms a pure heavy liquid.—*ib.*

GUARA, a town in its own juriſdiction on the road from Truxillo to Lima, containing about 200 houſes. It has a pariſh church, and a convent of Franciſcans, ſurrounded by fine plantations, and delightful improvements. At the ſouth end of Guara ſtands a large tower with a gate, and over it a kind of redoubt. This tower is erected before a ſtone bridge, under which runs Guara river. It lies in S. lat. 11° 31′ 36″. Not far from this town are ſtill to be ſeen a great many ruinous remains of the edifices of the Yncas or Incas; ſuch as walls of palaces, large dykes, by the ſides of ſpacious highways, fortreſſes, and caſtles, erected for checking the inroads of the enemy. —*ib.*

GUARCHI, a juriſdiction 6 leagues eaſt of Lima, in Peru, extends itſelf above 40 leagues along the Cordilleras, abounding in grain and fruits. It has ſome ſilver mines, but as the metal is indifferent, few are wrought.—*ib.*

GUARMOY, a ſmall maritime town of Peru, in South-America. It is the reſidence of a corregidore; has a good harbour, and lies 134 miles north-weſt of Lima, S. lat. 18° 3′ 53″.—*ib.*

GUASTACA, or *Panuco*, a province which borders on New Leon and Mexico, in which province are grain, cochineal, and ſome very rich ſilver mines. All the ſhores are low, overflowed, unhealthy, and full of ſalt marſhes.—*ib.*

GUATIMALA, *(Encycl.)*. There is a great chain of high mountains, which runs acroſs it from eaſt to weſt, and it is ſubject to earthquakes and ſtorms. It is, however, very fertile, and produces great quantities of chocolate, cochineal, cotton, indigo, honey, ſome balſam and woad. The merchandize of the province is generally conveyed to the port of St Thomas in the bay of Honduras, to be ſent to Europe. The way acroſs this province to the South Sea is about 65 leagues, and is the next to that from Vera Cruz to Acapulco. This province is called by the Indians *Quatuemallac*, which ſignifies a *rotten tree.*

St Jago de Guatimala, the capital city, is ſituated in a valley, through the midſt of which runs a river between two burning mountains. In 1541 this city was ruined by a dreadful tempeſt, and a number of the inhabitants were buried in the ruins. It was rebuilt at a good diſtance from the volcano, and became a large and rich town, with a biſhop's ſee, and an univerſity; but it was ſwallowed up by an earthquake in 1773. It contained about 60,000 inhabitants of all colours, and was immenſely rich, but there are no traces of it left. The loſs was valued at 15 millions ſterling; and it was the third city in rank in Spaniſh America. In this dreadful earthquake 8,000 families inſtantly periſhed. New Guatimala is built at ſome diſtance, is well inhabited, and carries on a great trade. N. lat. 13° 40′, W. long. 90° 30′.—*ib.*

GUAXACA, a province in the audience of Mexico, in New Spain, N. America, and its capital city of the ſame name. It reaches from the bay of Mexico on the north to the South Sea, having the province of Tlaſcala on the north-weſt, and thoſe of Chiapa and Tabaſco on the ſouth-eaſt. It extends nearly 95 leagues along the South Sea, 50 along the bay of Mexico, and near 120, ſay ſome, along the confines of Tlaſcala, but not above 50 on thoſe of Chiapa. The air here is good, and the ſoil fruitful, eſpecially in mulberry trees; ſo that it produces more ſilk than any province in America. Except the valley of Guaxaca (which is famous for giving the title of Marques del Valle to Ferdinand Cortez, the conqueror of Mexico) the greateſt part is mountainous, yet abounding with wheat, cattle, ſugar, cotton, honey, cocoa, plantanes and other fruits. It has rich mines of gold, ſilver, and lead; and all its rivers have gold in their ſands. Caſſia, cochineal, cryſtal, and copperas abound alſo here. Vanilla, a drug, uſed as a perfume to give chocolate a flavor, grows plentifully in this province. There were in this province 120 monaſteries, beſides hoſpitals, ſchools, and other places of public charity, 150 conſiderable towns, beſides upwards of 300 villages. But now the province is ſaid to be thinly inhabited.—*ib.*

Guaxaca, the capital of the laſt mentioned province, is a biſhop's ſee, and the reſidence of a governor. It lies 230 miles ſouth of the city of Mexico, 120 weſt of Spirito Santo, and 132 ſouth of the gulf of Mexico, and of Vera Cruz, in the delightful valley of Guaxaca, which is 40 miles in length and 20 in breadth; and on the road leading through Chiapa to Guatimala. This city contains a very ſtately cathedral, and ſeveral thouſand families, both Spaniards and Indians. It carries on a conſiderable trade with the N. and S. ſeas. The river is not fortified, ſo that it lies open to invaſion. The Creolian clergy here are bitter enemies to the Spaniſh clergy. According to ſome, the proper name of Guaxaca is *Antiquera;* but this laſt, others make a ſeparate town and biſhop's ſee alſo, ſituated about 80 miles to the S. W. It is ſaid to have a ſtately cathedral, adorned with many large and high pillars of marble, each of which is one entire ſtone. It is ſituated in N. lat. 18° 2′, W. long. 101° 10′. Guaxaca is ſituated, according to ſome, in N. lat. 17° 45′. W. long. 100°.—*ib.*

GUAYALAS, a province and juriſdiction in the archbiſhopric of Lima, in Peru, S. America; extends along the centre of the Cordilleras, begins 50 leagues N. N. E. of Lima; produces grain, fruits, and paſture for cattle.—*ib.*

GUAYAQUIL, called by ſome *Guiaquil*, by others *Guagaquil* and *Guayakal*, a city, bay, harbour and river, in Peru, South-America. Guayaquil city is the ſecond of Spaniſh origin, being as ancient as 1534; is ſituated on the weſt ſide of the river Guayaquil, north of the iſland of Puna, at the head of the bay, and about 155 miles S. S. W. of Quito, in 2° 11′ ſouth lat. 79° 17′ weſt long. Cividad Viega, or Old Town, was its firſt ſituation, but it was removed about a quarter of a league in 1693 by Orellana; and the communication over the great ravins or hollows of water, preſerved between the old and new towns by a wooden bridge of half a quarter of a league. The city is about two miles in extent; is defended by three forts, two on the river near the city, and the third behind it, guarding the entrance of a ravin. The churches, convents, and houſes are of wood. It contains about 20,000 inhabitants—Europeans, creoles and other caſts ; beſides a number of ſtrangers drawn hither by commercial intereſts. The women here are famed for their perſonal charms, polite manners, and elegant dreſs. The ſalt creek here abounds with lobſters and oyſters ; but the fiſh in the neighbourhood are not eſteemed, being full of bones, and unpalatable. But this place is moſt noted for a ſhell-fiſh called *turbine*, no bigger than a nut, which produces a purple reckoned to exceed all others in the world, and to vie with that of the Tyrians. It is called the purple of Punta, a place in the juriſdiction of Guayaquil. With this valuable and ſcarce purple, they dye the threads of cotton, ribbands, laces, &c. and the weight and colour are ſaid to exceed according to the hours of the day ; ſo that one of the firſt preliminaries to a contract is to ſettle the time when it ſhall be weighed. The dye is only the blood of the fiſh, preſſed out by a particular proceſs ; and the cotton ſo dyed is called by way of eminence *caracollillo*. The river Guayaquil is the channel of its commerce ; and the diſtance of the navigable part of it, to the cuſtom-houſe of Babahoio is reckoned about 24 leagues. The commerce of this place is conſiderable ; the productions of the country alone form the moſt conſiderable part of it ; theſe are cocoa, timber, ſalt, horned cattle, mules, and colts ; Guinea pepper, drugs, and lana de ceibo, a kind of wool, the product of a very high and tufted tree of that name, being finer than cotton. It is uſed for matraſſes and beds.—*ib.*

GUAYARA, La, a maritime town, and one of the chief of Caraccas, in South-America.—*ib.*

GUERITE, in Fortification, a centry-box ; being a ſmall tower of wood, or ſtone, uſually placed on the point of the baſtion, or on the angles of the ſhoulder, to hold a centinel, who is to take care of the ditch, and watch againſt a ſurpriſe.

GUIANDOT, a river of Virginia, which riſes in the Cumberland Mountain, and running a N. by W. courſe about 80 miles, falls into the Ohio river, about 34 miles below the Great Kanhaway. It is ſaid to be 60 yards wide at its mouth, and as many miles navigable for canoes.—*Morse.*

GUILDHALL, a townſhip in Eſſex county in Vermont, is ſituated on Connecticut river, and contains 158 inhabitants. It is oppoſite the mouth of Iſrael river in New-Hampſhire.—*ib.*

GUILFORD, a townſhip in Franklin county, Pennſylvania.—*ib.*

Guilford, a townſhip in Windham county, Vermont, on the weſt bank of Connecticut river, and oppoſite to the mouth of Aſhuelot river in New-Hampſhire. It has Hinſdale on the ſouth-eaſt, and the State of Maſſachuſetts on the ſouth, and contains 2432 inhabitants.—*ib.*

Guilford, a poſt-town of Connecticut, in New-Haven county, ſituated on the ſouth ſide of Long-Iſland Sound, about 18 miles E. by S. of New-Haven city. The townſhip is large, and is divided into 5 pariſhes, and was ſettled in 1639. It was called *Menuncatuck* by the Indians.—*ib.*

Guilford *County*, in Saliſbury diſtrict, North-Carolina, is bounded eaſt by Orange, weſt by Rowan, ſouth by Rockingham county, and north by the ſtate of Virginia. It is noted for the extenſive and rich tracts called New Garden, Buffaloe and Deep river lands. It contains 7191 inhabitants, incluſive of 576 ſlaves. Chief town, Martinville.—*ib.*

Guilford *Court-Houſe*. It is on the poſt-road from Halifax to Saliſbury, 48 miles ſouth-weſt of Hillſborough, and 61 eaſtward of Saliſbury.—*ib.*

GUILLOTINE, a new term introduced into the languages of Europe by the mournful effects of fanaticiſm in the holy cauſe of liberty. Our readers are not ignorant that this is the name given by the National Aſſembly of France to the engine of decapitation, which thoſe uſurpers of the legiſlative authority decreed to be the ſole puniſhment of thoſe condemned to death for their crimes. This decree was iſſued on March 20th 1792.

We do not imagine that the world will derive much uſeful inſtruction from a minute deſcription of this terrible inſtrument of public juſtice ; and therefore content ourſelves with giving two figures of it, ſufficiently expreſſive of its conſtruction. It is only the revival of an inſtrument uſed in former times. The earlieſt accounts that we have of it is, that it was uſed in the barony of Halyfax in Yorkſhire. It was alſo ſet up in Scotland ; but we have no certain information that it has ever been uſed ; and it is ſtill ſhewn as a ſort of curioſity by the name of the *Mayden.* See Maiden, *Encycl.*

Eratoſthenes could not think of a better way of handing down his name to future ages than by burning the temple of Diana at Epheſus ; Dr Guillotin, phyſician at Lyons, and member of the ſelf-named National Aſſembly of France, thought himſelf honoured by the decree which aſſociated his name with this inſtrument of popular vengeance. It was indeed propoſed by him as an inſtrument of mercy, in a ſtudied harangue, filled with that ſentimental ſlang of philanthropy, which coſts ſo little, promiſes ſo much, and has now corrupted all the languages of Europe. His invention is indeed one of the moſt expreſſive ſpecimens of Gallic philanthropy, whoſe tender mercies are cruel ; and was accordingly received with loud applauſes, both from the houſe, and from the galleries. To proceed, however, with impoſing dignity, it was referred to the conſideration of a committee, with injunctions to aſk the opinion of able ſurgeons of its efficiency. Mr Louis, a celebrated ſurgeon of Paris, declared it well fitted for the taſk, in a long pedantic diſſertation ; in which he takes occaſion to deliver, with academic coldneſs, a theory of the operation of cutting inſtruments ; and ſays that he had examined the edge of the guillotine and other ſuch inſtruments, with a microſcope, and had diſcovered that the fineſt edges were toothed like a ſaw. M. Guillotin, he ſaid, had therefore with great judgment made the axe of his engine of death with a ſloping edge, by which means *il gliſſoit d'une façon infinitment plus douce.* This diſſertation was ſo much to the taſte of the humane legiſlature, that they rewarded Mr Louis with 2000 livres, and publiſhed it in the Paris Journals. As to the inventor, he reaped all the benefit from it which he ſo kindly intended for the nation, by the trial of it on his own perſon, when he fell under the diſpleaſure of Robeſpierre.

We acknowledge, that in as far as this inſtrument leſſens the duration of the horrid conflict with the king of terrors, and probably diminiſhes the corporeal ſufferance, it may be called merciful (alas! the day!); but we queſtion much, whether the dreadful agitation of ſoul is not rather increaſed by the long train of preparatory operations. The hands of the convict are tied behind his back: he is then ſtretched along on his face on a ſtrong plank, and his preciſe poſition adjuſted to the inſtrument. When faſtened to the plank, it is puſhed forward into its place, under the fatal edge, his neck adjuſted to the block, and a baſket placed juſt before his eyes (for the face of Louis XVI. was not covered) to receive his head. This muſt employ a good deal of time, and every moment is terrible.

The conſtruction has received many alterations and refinements; and has at laſt been made ſo compendious and portable, as to become part of the travelling equipage of a commiſſioner from the National Aſſembly, ſent on a provincial or ſpecial viſitation. Thus did the ſovereign people become terrible in majeſty. So ſenſible was the Aſſembly of the advantages of this awful impreſſion, or ſo intoxicated with the enjoyment of irreſiſtible power, that they have thought their coins ornamented by this attribute of their ſupremacy: and as Jupiter is diſtinguiſhed by his thunderbolt, ſo the majeſty of the people is diſtinguiſhed by the no leſs fatal axe. We have ſeen a piece of ten ſous, ſtruck at Mentz in 1793, and iſſued as current money, at the very time that they were planting the tree of liberty in that illuminated city by the hands of Cuſtine and his troops. The device is the faſces and axe of ancient Rome, crowned with the red cap, and ſurrounded by a laurel wreath. The inſcription is, *Republique Françoiſe*, 1793, *an.* 2d. Fully impreſſed with the ſame ſentiments, Lequinio, the ſentimental novelliſt of France, whom Mercier compares with the tender, the heart-touching Sterne—Lequinio, now commiſſioner ſent by the National Aſſembly to regenerate Normandy and Brittany, writes to his maſters, that "he is very ſucceſsful in converſions from ſuperſtition to ſound reaſon." He oppoſes to the bible and the relicts of the ſaints the conſtitution and the guillotine. "And you would wonder (ſays he) at my ſucceſs—The wiſe (but they are few) give up their prejudices at once; but the multitude, the ſtupid worſhippers of *Notre Dame*, look at our lady the guillotine; are ſilent, become ſerious, and their doubts vaniſh;—they are converted. This is your *labarum*—*in hoc ſigno vinces*."

GULA, **Gueule**, or **Gola**, in Architecture, a wavy member whoſe contour reſembles the letter S, commonly called an Ogee.

GULF of Florida, or *New Bahama Channel*, is bounded on the weſt by the peninſula of Eaſt-Florida, and on the eaſt by the Bahama Iſlands. It is generally about 40 miles wide, and extends from the 25th to the 28th degree of N. latitude.—*Morse.*

Gulf Stream. This remarkable phenomenon is a current in the ocean which runs along the coaſt, at unequal diſtances from Cape Florida to the Iſle of Sables and the banks of Newfoundland, where it turns off and runs down through the Weſtern iſlands; thence to the coaſt of Africa, and along that coaſt in a ſouthern direction, till it arrives at, and ſupplies the place of thoſe waters carried by the conſtant trade-winds from the coaſt of Africa toward the weſt, thus producing a conſtant circulating current. This ſtream is about 75 miles from the ſhores of the Southern ſtates, and the diſtance increaſes as you proceed northward. The width of it is about 40 or 50 miles, widening towards the north. Its common rapidity is three miles an hour. A north-eaſt wind narrows the ſtream, renders it more rapid, and drives it nearer the coaſt. North-weſt and weſt winds have a contrary effect. The Gulf-Stream is ſuppoſed to be occaſioned by the trade-winds that are conſtantly driving the water to the weſtward, which being compreſſed in the Gulf of Mexico, finds a paſſage between Florida and the Bahama Iſlands, and runs to the north-eaſt along the American coaſt. This hypotheſis is confirmed by another fact: It is ſaid that the water in the Gulf of Mexico is many yards higher than on the weſtern ſide of the continent in the Pacific Ocean. It is highly probable that the ſand carried down by great rivers into bays, and the current out of theſe bays meeting with the Gulf Stream, by their eddies, have formed Nantucket Shoals, Cape Cod, George's Bank, the Iſland of Sable, &c.

Skilful navigators, who have acquired a knowledge of the extent to which this ſtream reaches on the New-England coaſt, have learnt, in their voyages from Europe to New-England, New-York, or Pennſylvania, to paſs the banks of Newfoundland in about 44° or 45° N. lat. to ſail thence in a courſe between the northern edge of the Gulf Stream, and the ſhoals and banks of Sable Iſland, George's Bank, and Nantucket, by which they make better and quicker voyages to America. —*ib.*

GUNPOWDER, as we have obſerved in the *Encyclopædia* under the word Gun, has been known in the eaſt, and particularly in China, from a period of very remote antiquity. No man, however, ſeems to have ſuſpected that the knowledge of it was conveyed from the eaſt into Europe; but all have agreed to allow the merits of the invention both to friar Bacon and to Bartholomew Schwartz. This generally received opinion has been lately controverted by citizen Langles, who, in a memoir read in the French national inſtitute, contends, that the knowledge of gunpowder was conveyed to us from the Arabs, on the return of the Cruſaders to Europe. He aſſures us that the Arabs made uſe of it in 690 at the ſiege of Mecca; and he adds, that they derived it from the Indians, among whom it muſt have been known in the remoteſt ages, ſince their ſacred books (the Vedam) forbid the uſe of it in war.

It is indeed extremely probable, that the compoſition of gunpowder was known in India at a very early period; for in whatever country nature forms nitre in the greateſt plenty, there its deflagrating quality is moſt likely to be firſt obſerved; and a few experiments founded on that obſervation, will lead to the compoſition which produces ſuch ſudden and violent effects. "Nitre (ſays Sir George Staunton) is the natural and daily produce of China and India; and there, accordingly, the knowledge of gunpowder ſeems to be coeval with that of the moſt diſtant hiſtoric events. Among the Chineſe, it has been applied at all times to uſeful purpoſes, ſuch as blaſting rocks, and removing great obſtructions, and to thoſe of amuſement in making a vaſt variety of fire-works. It was alſo uſed as a defence, by undermining the probable paſſage of the enemy, and blowing him up. But its force had not been directed through ſtrong metallic tubes as it was by Europeans ſoon after they had diſcovered it. And though, in imitation of Europe, it has been introduced into the armies of the Eaſt, other modes of warfare are ſometimes ſtill preferred to it."

Of gunpowder manufactured by thoſe who have manufactured it ſo long, it is deſirable to know the compoſition and the qualities. It was therefore natural for the Hon. George Napier, when ſuperintending the royal laboratory at Woolwich, and making experiments upon ſo neceſſary an implement of modern war, to procure ſome Chineſe powder from Canton.

This he did; and analyzing two ounces of it, he found, after repeating the operation ſix times, that the mean reſult gave the following proportions*. Nitre 1 oz. 10 dwts. charcoal 6 dwts. ſulphur 3 dwts. 14 grs. Here is a deficiency in weight of ten grains, which M. Napier ſuppoſes the conſequence of ſome defect in his proceſs; but as M. Baumé, a French chemiſt, made a variety of experiments to obtain a total ſeparation of the ſulphur from the charcoal of gunpowder, and was never able to effect it, one fourteenth part remaining united, three grains muſt be deducted from the charcoal, and added to the ſulphur to give the accurate proportion of the ingredients; which by turning to the article GUNPOWDER, *Encycl.* the reader will perceive differs ſomewhat from the proportion of the ſame ingredients in the gunpowder of Europe. This Chineſe powder was uſually large-grained and not ſtrong, but very durable. It had been made many years when our author got it; yet there was no viſible ſymptom of decay, the grain being hard, well coloured, and though angular, it was even-ſized, and in perfect preſervation.

When we conſider the operations in which gunpowder is employed, it is obvious that it muſt be an object of importance to aſcertain its exploſive force; and yet there is ſcarcely a ſubject concerning which the moſt approved writers have ſo much differed. Mr Robins, who has done more towards perfecting the art of gunnery than any other individual, ſtates the exploſive force of gunpowder to be 1000 times greater than the mean preſſure of the atmoſphere; while the celebrated Daniel Bernouilli determines it not to be leſs than 10,000 times this preſſure. Such a difference of opinion led Count Rumford to purſue a courſe of experiments, of which ſome were publiſhed in the Tranſactions of the Royal Society for the year 1781, and the remainder in the Tranſactions of the ſame Society for 1797; with the view principally of determining the initial expanſive force of gunpowder. By one of theſe experiments, it appeared that, calculating even on Mr Robins's own principles, the force of gunpowder, inſtead of being 1000 times, muſt at leaſt be 1308 times greater than the mean preſſure of the atmoſphere. From this experiment, the Count thought himſelf warranted in concluding, that the principles aſſumed by Mr Robins were erroneous, and that his mode of aſcertaining the force of gunpowder could never ſatisfactorily determine it. Deſpairing of ſucceſs in that way, he reſolved to make an attempt for aſcertaining this force by actual meaſurement; and after many unſucceſsful experiments, he was at length led to conclude, that this force was at leaſt 50,000 times greater than the mean preſſure of the atmoſphere.

Mr Robins apprehends that the force of fired gunpowder conſiſts in the action of a permanently elaſtic fluid, ſimilar, in many reſpects, to common atmoſpherical air; and this opinion has been very generally received: but Count Rumford thinks, that though the permanently elaſtic fluids, generated in the combuſtion of gunpowder, aſſiſt in producing the effects which reſult from its exploſion, its enormous force, allowing it to be 50,000 times greater than the mean preſſure of the atmoſphere, cannot be explained, without ſuppoſing that it ariſes principally from the elaſticity of the aqueous vapour generated from the powder in its combuſtion.

"The brilliant diſcoveries of modern chemiſts (ſays he) have taught us, that both the conſtituent parts of which water is compoſed, and even water itſelf, exiſt in the materials which are combined to make gunpowder; and there is much reaſon to believe that water is actually formed, as well as diſengaged, in its combuſtion. M. Lavoiſier, I know, imagined that the force of fired gunpowder depends in a great meaſure upon the expanſive force of uncombined *caloric*, ſuppoſed to be let looſe in great abundance during the combuſtion or deflagration of the powder: but it is not only dangerous to admit the action of an agent whoſe exiſtence is not yet clearly demonſtrated; but it appears to me that this ſuppoſition is quite unneceſſary, the elaſtic force of the heated aqueous vapour, whoſe exiſtence can hardly be doubted, being quite ſufficient to account for all the phænomena. It is well known that the elaſticity of aqueous vapour is incomparably more augmented by any given augmentation of temperature than that of any permanently elaſtic fluid whatever; and thoſe who are acquainted with the amazing force of ſteam, when heated only to a few degrees above the boiling point, can eaſily perceive that its elaſticity muſt be almoſt infinite when greatly condenſed and heated to the temperature of red hot iron; and this heat it muſt certainly acquire in the exploſion of gunpowder. But if the force of fired gunpowder ariſes *principally* from the elaſtic force of heated aqueous vapour, a cannon is nothing more than a *ſteam engine* upon a peculiar conſtruction; and upon determining the ratio of the elaſticity of this vapour to its denſity, and to its temperature, a law will be found to obtain very different from that aſſumed by Mr Robins in his Treatiſe on Gunnery."

In order to meaſure the elaſtic force of fired gunpowder, Count Rumford adopted a new plan; and, inſtead of cauſing the generated elaſtic fluid to act on a moveable body through a determined ſpace, which he had found to be ineffectual to his purpoſe, he contrived an apparatus in which this fluid ſhould be made to act, "by a determined ſurface againſt a weight, which, by being increaſed at pleaſure, ſhould at laſt be ſuch as would juſt be able to confine it, and which in that caſe would juſt counterbalance and conſequently *meaſure* the elaſtic force."

Having ſucceeded in ſetting fire to the powder, without any communication to the external air, "by cauſing the heat employed for that purpoſe to paſs through the ſolid ſubſtance of the barrel, it only remained to apply ſuch a weight to an opening made in the barrel, as the whole force of the generated elaſtic fluid ſhould not be able to lift or diſplace." Many precautions were neceſſary. A ſolid block of very hard ſtone, four feet four inches ſquare, was placed upon a bed of ſolid maſonry, which deſcended ſix feet below the ſurface of the earth. Upon this block of ſtone, which ſerved as a baſe to the whole machinery, was placed the ſmall barrel, in which the exploſions were made, with its opening directly upwards. This opening was cloſed by a ſolid hemiſphere of hardened ſteel, on which the weight to be overcome by the exploſion was laid. Having charged the barrel with 10 grains of powder, its whole contents being about 28 grains, and a 24 pounder weighing 8081 lbs avoirdupois, being placed on its caſcabel ſo as by its weight to confine the generated elaſtic fluid, a heated iron ball was applied to the end of the vent tube, (a ſmall ſolid projection from the centre of the bottom of the barrel). In a few moments the powder took fire, though the exploſion made a very feeble report; and when the weight was raiſed, the confined elaſtic vapour ruſhed out of the barrel. The ſlight effect produced by this exploſion induced ſome of the attendants on this occaſion to undervalue the importance of this experiment, and to form a very inadequate idea of the real force of the elaſtic fluid that had been thus almoſt inſenſibly diſcharged. In a ſecond experiment, the barrel was filled with powder, and the ſame weight laid on as before. The barrel was made of the beſt hammered iron, and uncommonly ſtrong. The charge of powder amounted to little more than $\frac{1}{10}$ of a cubic inch, which is not ſo much as would be required to load a ſmall pocket piſtol, and not *one-tenth* part of the quantity frequently uſed for the charge of a common muſket. Yet this inconſiderable quantity of powder, when ſet on fire, exploded with a force that burſt the barrel, and with a loud report that alarmed the whole neighbourhood.

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* *Tranſactions of the Royal Iriſh Academy.*

The author proceeds to make an eſtimate from the known ſtrength of iron, and the area of the fracture of the barrel in the preceding experiment, of the real force employed by the elaſtic vapour to burſt it; and he computes that it muſt have been equal to the preſſure of a weight of 412529 lbs.; which, by another computation, he found to be 55004 times greater than the mean preſſure of the atmoſphere. By another proceſs, he inveſtigates the ſtrength of the iron of which the barrel was made; and he thence finds that the force required to burſt it was equal to the preſſure of a weight of 410624½ lbs. This weight, reduced into atmoſpheres, gives 54750 atmoſpheres for the meaſure of the force exerted by the elaſtic fluid in the preſent inſtance. This force muſt be conſiderably leſs than the initial force of the elaſtic fluid generated in the combuſtion of gunpowder, before it has begun to expand; "for it is more than probable (ſays Count Rumford) that the barrel was in fact burſt before the generated elaſtic fluid had exerted all its force, or that this fluid would have been able to have burſt a barrel ſtill ſtronger than that uſed in the experiment."

After having ſhewn the extreme force of fired gunpowder, the Count adverts to an objection which may be made againſt his deductions. How does it happen that fire-arms and artillery of all kinds, which certainly are not calculated to withſtand ſo enormous a force, are not always burſt when they are uſed? Inſtead of anſwering this queſtion, by aſking how it happened that the extremely ſtrong barrel uſed in his experiment could be burſt by the force of gunpowder, if this force be not in fact much greater than it has ever been ſuppoſed to be, he proceeds to ſhew that the combuſtion of gunpowder, inſtead of being inſtantaneous, as Mr Robins's theory ſuppoſes, is much leſs rapid than has hitherto been apprehended; an obſervation which, if eſtabliſhed, is certainly ſufficient to anſwer the objection.

He remarks, that it is a well-known fact, that on the diſcharge of fire-arms of all kinds, there is always a conſiderable quantity of unconſumed grains of gunpowder blown out of them; and what is very remarkable, as it leads directly to a diſcovery of the cauſe of this effect, theſe unconſumed grains are not merely blown out of the muzzles of fire-arms, but come out alſo by their vents or touch-holes, where the fire enters to inflame the charge, as many perſons who have had the misfortune to ſtand with their faces near the touch-hole of a muſket, when it has been diſcharged, have found to their coſt.

It appears extremely improbable to our author, if not abſolutely impoſſible, that a grain of gunpowder actually in the chamber of the piece, and completely ſurrounded by flame, ſhould, by the action of that very flame, be blown out of it without being at the ſame time ſet on fire. And, if this be true, he conſiders it as a moſt deciſive proof, not only that the combuſtion of gunpowder is leſs rapid than it has generally been thought to be, but that a grain of gunpowder actually on fire, and burning with the utmoſt violence over the whole of its ſurface, may be projected with ſuch a velocity into a cold atmoſphere, as to extinguiſh the fire, and ſuffer the remains of the grain to fall to the ground unchanged, and as inflammable as before.

This extraordinary fact was aſcertained beyond all poſſibility of doubt by the Count's experiments. Having procured from a powdermill in the neighbourhood of the city of Munich, a quantity of gunpowder, all of the ſame maſs, but formed into grains of very different ſizes, ſome as ſmall as the grains of the fineſt Battel powder, he placed a number of vertical ſcreens of very thin paper, one behind another, at the diſtance of 12 inches from each other; and loading a common muſket repeatedly with this powder, ſometimes without and ſometimes with a wad, he fired it againſt the foremoſt ſcreen, and obſerved the quantity and effects of the unconſumed grains of powder which impinged againſt it. The ſcreens were ſo contrived by means of double frames united by hinges, that the paper could be changed with very little trouble, and it was actually changed after every experiment.

The diſtance from the muzzle of the gun to the firſt ſcreen was not always the ſame; in ſome of the experiments it was only 8 feet, in others it was 10, and in ſome 12 feet.

The charge of powder was varied in a great number of different ways; but the moſt intereſting experiments were made with one ſingle large grain of powder, propelled by ſmaller and larger charges of very finegrained powder.

Theſe large grains never failed to reach the ſcreen; and though they ſometimes appeared to have been broken into ſeveral pieces by the force of the exploſion, yet they frequently reached the ſcreen entire; and ſometimes paſſed through all the ſcreens (five in number) without being broken.

When they were propelled by large charges, and conſequently with great velocity, they were ſeldom on fire when they arrived at the firſt ſcreen; which was evident not only from their not ſetting fire to the paper (which they ſometimes did), but alſo from their being found ſticking in a ſoft board, againſt which they ſtruck, after having paſſed through all the five ſcreens; or leaving viſible marks of their having been impinged againſt it, and being broken to pieces and diſperſed by the blow. Theſe pieces were often found lying on the ground; and from their forms and dimenſions, as well as from other appearances, it was often quite evident that the little globe of powder had been on fire, and that its diameter had been diminiſhed by the combuſtion before the fire was put out, on the globe being projected into the cold atmoſphere.

That theſe globes or large grains of powder were always ſet on fire by the combuſtion of the charge, can hardly be doubted. This certainly happened in many of the experiments; for they arrived at the ſcreens on fire, and ſet fire to the paper; and in the experiments in which they were projected with ſmall velocities, they were often ſeen to paſs through the air on fire; and when this was the caſe, no veſtige was to be found. They ſometimes paſſed on fire through ſeveral of the foremoſt ſcreens, without ſetting them on fire, and ſet fire to one or more of the hindmoſt, and then went on and impinged againſt the board, which was placed at the diſtance of 12 inches behind the laſt ſcreen.

The Count then proceeds to mention another experiment, in which the progreſſive combuſtion of gunpowder was ſhewn in a manner ſtill more ſtriking, and not leſs concluſive.

A ſmall piece of red hot iron being dropped down into the chamber of a common horſe-piſtol, and the piſtol being elevated to an angle of about 45 degrees, upon dropping down into its barrel one of the ſmall globes of powder (of the ſize of a pea), it took fire, and was projected into the atmoſphere by the elaſtic fluid generated in its own combuſtion, leaving a very beautiful train of light behind it, and diſappearing all at once like a falling ſtar. This amuſing experiment was repeated very often, and with globes of different ſizes. When very ſmall ones were uſed ſingly, they were commonly conſumed entirely before they came out of the barrel of the piſtol; but when ſeveral of them were uſed together, ſome, if not all of them, were commonly projected into the atmoſphere on fire.

As the ſlowneſs of the combuſtion of gunpowder is undoubtedly the cauſe which has prevented its enormous and almoſt incredible force from being diſcovered, our author deduces, as an evident conſequence, that the readieſt way to increaſe its effects, is to contrive matters ſo as to accelerate its inflammation, and combuſtion. This may be done in various ways; but, in his opinion, the moſt ſimple and moſt effectual manner of doing it would be to ſet fire to the charge of powder, by ſhooting (through a ſmall opening) the flame of a ſmaller charge into the midſt of it.

He contrived an inſtrument on this principle for firing cannon three or four years ago; and it was found, on repeated trials, to be uſeful, convenient in practice, and not liable to accidents. It likewiſe ſuperſedes the neceſſity of uſing priming, of vent-tubes, port-fires, and matches, and on that account he imagined it might be of uſe in the Britiſh navy, but it does not appear to have been received into practice.

Another infallible method of increaſing very conſiderably the effect of gunpowder in fire-arms of all ſorts and dimenſions, would be to cauſe the bullet to fit the bore exactly, or without windage, in that part of the bore at leaſt where the bullet reſts on the charge; for, when the bullet does not completely cloſe the opening of the chamber, not only much of the elaſtic fluid, generated in the firſt moment of the combuſtion of the charge, eſcapes by the ſide of the bullet; but what is of ſtill greater importance, a conſiderable part of the unconſumed powder is blown out of the chamber along with it in a ſtate of actual combuſtion, and, getting before the bullet, continues to burn on as it paſſes through the whole length of the bore; by which the motion of the bullet is much impeded.

The loſs of force which ariſes from this cauſe, is in ſome caſes almoſt incredible; and it is by no means difficult to contrive matters ſo as to render it very apparent, and alſo to prevent it.

If a common horſe-piſtol be fired with a looſe ball, and ſo ſmall a charge of powder that the ball ſhall not be able to penetrate a deal board ſo deep as to ſtick in it when fired againſt it from the diſtance of ſix feet; the ſame ball, diſcharged from the ſame piſtol with the ſame charge of powder, may be made to paſs quite through one deal board, and bury itſelf in a ſecond placed behind it, merely by preventing the loſs of force which ariſes from what is called windage, as he found more than once by actual experiment.

The Count has in his poſſeſſion a muſket, from which, with a common charge of powder, he fires two bullets at once with the ſame velocity that a ſingle bullet is diſcharged from a muſket on the common conſtruction with the ſame quantity of powder. And, what renders the experiment ſtill more ſtriking, the diameter of the bore of his muſket is exactly the ſame as that of a common muſket, except only in that part of it where it joins the chamber, in which part it is juſt ſo much contracted, that the bullet, which is next to the powder, may ſtick faſt in it. He adds, that though the bullets are of the common ſize, and are conſequently conſiderably leſs in diameter than the bore, means are uſed which effectually prevent the loſs of force by windage; and to this laſt circumſtance, he concludes, it is doubtleſs owing, in a great meaſure, that the charge appears to exert ſo great a force in propelling the bullets.

That the conical form of the lower part of the bore where it unites with the chamber has a conſiderable ſhare in producing this extraordinary effect, is, however, very certain, as he has found by experiment made with a view merely to aſcertain that fact.

At the cloſe of the Count's laſt memoir, we have a computation, deſigned to ſhew that the force of the elaſtic fluid generated in the combuſtion of gunpowder, enormous as it is, may be ſatisfactorily explained on the ſuppoſition that it depends *ſolely* on the elaſticity of watery vapour, or ſteam. From experiments made in France in the year 1790, it appears that the elaſticity of ſteam is doubled by every addition of temperature equal to 30° of Fahrenheit's thermometer. As the heat generated in the combuſtion of gunpowder cannot be leſs than that of red-hot iron, it may be ſuppoſed equal to 1000° of Fahrenheit's ſcale:—but the elaſtic force of ſteam is juſt equal to the mean preſſure of the atmoſphere, when its temperature is equal to that of boiling water, or to 212° of Fahrenheit's thermometer; conſequently $212^\circ+30^\circ=240^\circ$ will repreſent the temperature, when its elaſticity will be equal to the preſſure of two atmoſpheres; and, purſuing the calculation, at 602° or 2° above the heat of boiling linſeed oil, its elaſticity will be equal to the preſſure of 8192 atmoſpheres, or above *eight times* greater than the utmoſt force of the fluid generated in the combuſtion of gunpowder, according to Mr Robins's computation: but the heat in this caſe is much greater than that of 602° of Fahrenheit; and therefore the elaſticity of the ſteam generated from the water contained in the powder muſt be much greater than the preſſure of 8192 atmoſpheres. At 722°, the elaſticity will be equal to the preſſure of 131,072 atmoſpheres; and this temperature is leſs than the heat of iron, which is viſibly red-hot in daylight, by 355°:—but the flame of gunpowder has been found to melt braſs, which requires a heat equal to that of 3807° of Fahrenheit; 2730° above the heat of red-hot iron, or 3805° higher than the temperature which gives to ſteam an elaſticity equal to the preſſure of 131,072 atmoſpheres. That there is in gunpowder water ſufficient for ſupplying the neceſſary quantity of ſteam, the author has very ſatisfactorily evinced: but we muſt not purſue his curious inveſtigations any farther. Thoſe who want a fuller account of them, will find it either in the original memoirs themſelves, or in a very accurate abridgement of theſe memoirs in the firſt volume of Nicholſon's *Journal of Natural Philoſophy*, &c.

We cannot conclude this article without mentioning a new kind of gunpowder, invented ſome years ago in France, in which the marine acid is ſubſtituted, in equal quantity, for nitre. Dr Hutton tried ſome of this new powder which was made at Woolwich, and found it of about double the ſtrength of the ordinary ſort; but it is not likely to come into common and general uſe, for the preparation of the acid is difficult and expenſive, (See CHEMISTRY-*Index* in this *Suppl.*), and the powder which is made of it catches fire and explodes from the ſmalleſt degree of heat, and without the aid of a ſpark. It is to this circumſtance, however, that its ſuperior ſtrength ſeems to be in a great meaſure owing.

GUNPOWDER, a river of the weſtern ſhore of Maryland, whoſe chief branches unite a little above Joppa, and empty into Cheſapeak Bay, about 12 miles above Patapſco river. It is navigable only a few miles, by reaſon of falls.—*Morse.*

GUNPOWDER NECK, near the head of Cheſapeak Bay, is a curious peninſula formed by Gunpowder river, and Buſh river.—*ib.*

GUNTER's CHAIN. See GEOMETRY, *Encyclopædia*, Part II. chap. 1.

GUT-TIE, a dangerous diſeaſe to which oxen and male calves are rendered liable by an improper mode of caſtration. In ſome places, and particularly in Herefordſhire, the breeders of cattle, when they caſtrate their calves, open the *ſcrotum*, take hold of the teſticles with their teeth, and tear them out with violence; by which means all the veſſels thereto belonging are ruptured. The *vaſa deferentia*, entering by the holes of the tranſverſe and oblique muſcles into the abdomen, paſs over the ureters in acute angles; at which turning, by their great length and elaſtic force, the peritoneum is ruptured; the *vaſa deferentia* are ſevered from the teſticles, and ſpringing back, form a kind of bow from the urethra, where they are united, over the ureters, to the tranſverſe and oblique muſcles, and there again unite, where they firſt entered the abdomen; the part of the gut that is tied is the jejunum, at its turning from the left ſide to the right, and again from the right to the left, forming right angles under the kidney, and attached to the duplicature of the peritoneum, to which it was united, where the rupture happened. There the bow of the gut hangs over the bow of the *vaſa deferentia*, which, by a ſudden motion, or turn of the beaſt, form a hitch or tie of the ſtring round the bow of the gut (filled with air), ſimilar to what a carter makes on his cart line. This cauſes a ſtoppage in the bowels, and brings on a mortification, which, in two days, or four at moſt, proves fatal: And to this accident is the beaſt, when caſtrated as above, liable from the day that he was caſtrated till the time of his being ſlaughtered.

The ſymptoms of the gut-tie are the ſame as thoſe of an incurable colic, *volvulus*, or mortification of the bowels. The beaſt affected with this complaint will kick at its belly, lie down, and groan; it has alſo a total ſtoppage in its bowels (except blood and mucus, which it will void in large quantities), and a violent fever, &c. To diſtinguiſh with certainty the gut-tie from the colic, &c. the hand and arm of the operator muſt be oiled, and introduced into the anus, through the rectum, beyond the os pubis, turning the hand down to the tranſverſe and oblique muſcles, where the veſſels of the teſticles enter the abdomen. There the ſtring will be found united to the muſcles, and is eaſily traced to the ſtricture by the hand, without pain to the beaſt.

From the general view of the agriculture of the county of Hereford, drawn up by Mr Clark of Builth, Breconſhire, we learn that Mr Harris farmer at Wickton, near Leominſter, had been uncommonly ſucceſsful in the cure of the gut-tie. That gentleman informs us, that he had cut cattle for this diſeaſe from the age of three months to that of nine years; and as it is a matter of great importance, we ſhall ſtate his method of operating in his own words.

"The only method of cure (ſays he) that can be ſafely ventured upon is, to make a perpendicular inciſion, four inches under the third vertebra of the loins, on the left ſide, over the paunch or ſtomach, and introduce the arm to find the part affected; if poſſible, keep the beaſt ſtanding by the help of proper aſſiſtants. The knife I make uſe of to ſever the ſtring is in the form of a large fiſh hook, with an edge on the concave ſide; it is fixed to a ring, which fits the middle finger, which finger crooks round the back of the knife, the end of the thumb being placed on its edge. The inſtrument, by being thus held in the hand, is ſecured from wounding the ſurrounding inteſtines; with it I divide the ſtring or ſtrings, and bring out one or both as circumſtances require. Here it is to be obſerved, that great care muſt be taken by the operator not to wound or divide the ureters, which would be certain death. I then ſew up the divided lips of the peritoneum very cloſe, with a ſurgeon's needle threaded with ſtrong thread, eight or ten double, ſufficiently waxed;

I alſo ſew up the ſkin, leaving a vacancy at the top and bottom of the wound ſufficiently wide to introduce a tent of ſurgeon's tow, ſpread with common digeſtive and traumatic balſam; covering the inciſion with a plaſter made of the whites of eggs and wheat flour. The wound, thus treated and dreſſed every day, will be well in a fortnight. The medicine I give to remove the ſtoppage in the three ſtomachs occaſioned by the tie, and to carry off the fever, is four ounces of Glauber's ſalt, two ounces of cream of tartar, and one ounce of ſenna, infuſed in two pounds of boiling water, adding half a pound of olive-oil, and working it off with plenty of gruel, mixed with a large quantity of infuſion of mallows and elder-bark. I adminiſter the gruel and infuſion for at leaſt two or three days; by which time the beaſt will be well, will eat his provender, and chew the cud, and will for ever be relieved, and remain ſafe from this fatal diſorder.

"The following ſimple and eaſy method of caſtration will effectually prevent the gut-tie. Open the ſcrotum, looſen out the teſticles, and tie the ſeveral veſſels with a waxed thread or ſilk; or ſear them with a hot iron, to prevent their bleeding, as in the common way of cutting colts. This method can never diſplace the veſſels of the teſticles, bladder, kidneys, or inteſtines; all of which remain covered or attached to the peritoneum, or lining of the abdomen of the beaſt, which renders it impoſſible that there ſhould ever be a ſtricture or tie on the gut."

GUZ, an Indian meaſure, varying in different places, but which may be reckoned about an Engliſh yard. The guz of Akbar was 41 fingers.

H.

HACHA, Rio de la, or *La Hacha*, a province, its chief town, and a river, in Terra Firma or Caſtile del Oro, in South-America. The province is ſurrounded on two ſides by the ocean, viz. on the N. and N. W. and on the third eaſtward by the gulf of Venezuela. The town is ſituated at the mouth of the river, and on its weſt ſide, on a little hill about a mile from the ſea. The ſoil about it is very rich, and abounds with productions common to the climate, alſo European plants and fruits; well ſupplied with ſalt ſprings, veins of gold, and ſome gems of great value. The harbour is none of the beſt, being expoſed to the north winds. It is about 8 leagues from New-Salamanca, and 18 from Cape Vela, N. by E. and 246 miles eaſt of Carthagena. Here the Spaniſh Galleons touch at their arrival in South-America, from whence expreſſes are ſent to all the ſettlements, to give them notice of it. In 1595 it was ſurpriſed and ſacked by Sir Francis Drake. N. lat. 11° 30′, W. long. 72°.—*Morse.*

HACKETSTOWN, a ſmall poſt-town in Suſſex county, New-Jerſey, on the north-weſt ſide of Muſconecunk river. It is about three miles above the mineral ſpring near Roxbury, on the oppoſite ſide of the river, 22 miles W. by N. of Morriſtown, 16 S. W. by W. of Suſſex court-houſe, and 120 N. N. E. of Philadelphia. —*ib.*

HACKINSACK, a river of New-Jerſey which riſes in New-York, and runs a ſoutherly courſe four or five miles weſt of Hudſon's river. It unites with Paſſaic river at the head of Newark bay, and is navigable about 15 miles.—*ib.*

Hackinsack, the chief town in Bergen county, New-Jerſey, is ſituated near the weſt bank of the above river, 20 miles North-weſt of New-York city. The inhabitants are moſtly Dutch. The houſes are chiefly built of ſtone, in the old Dutch taſte. Here are four public buildings, a Dutch and Epiſcopal church, a court-houſe, and a flouriſhing academy. The people, who are moſtly farmers, carry their produce to New-York.—*ib.*

HADDAM, a town of Connecticut, the ſecond in rank in Middleſex county, ſituated on the weſt ſide of Connecticut river, 18 or 20 miles from its mouth, and 10 miles ſouth-eaſt of the city of Middletown. This townſhip, including Eaſt-Haddam, on the oppoſite ſide of the river, was purchaſed of the Indians, May 20th, 1662. A ſpot in Eaſt-Haddam was famous for Indian *Pawaws*, and was ſubject for many years to earthquakes and various noiſes, which the firſt ſettlers, agreeable to the ſuperſtitious ideas of that age, attributed to theſe *Pawaws*. An old Indian being aſked what was the reaſon of ſuch noiſes in this place? anſwered, The Indian's God was very angry becauſe the Engliſhmen's God came here." Theſe noiſes are now frequently heard.—*ib.*

HADDONFIELD, a ſmall town in Glouceſter county, New-Jerſey, 9 miles S. E. by E. of Philadelphia, and 17 from Burlington.—*ib.*

HADLEY, a pleaſant town in Hampſhire county, Maſſachuſetts, lying on the eaſt ſide of Connecticut river, nearly oppoſite to Northampton, 20 miles north of Springfield, and 97 weſt of Boſton. The town conſiſts of two long ſpacious ſtreets, which run parallel with each other, and with the river. The townſhip contains 882 inhabitants.—*ib.*

HAGARSTOWN, now called *Elizabeth-Town*. It has a conſiderable trade with the weſtern country, and has between two and 300 houſes. It is ſituated in Waſhington county, Maryland; it is a poſt-town 26 miles north-weſt of Fredericktown, 73 N. W. by W. of Baltimore, and 22 S. by W. of Chamberſburg in Pennſylvania.—*ib.*

HALBUT Point, the north-eaſt point of Cape Anne, in Maſſachuſetts.—*Morſe.*

HALF MOON, an extenſive townſhip in Albany county, New-York. It contains 3,600 inhabitants; of theſe, 128 are ſlaves, and 563 are qualified electors. *Waterford*, a neat, compact, thriving village of about 70 or 80 houſes, two miles E. N. E. of the Cohoez, and 12 miles north of Albany, on the north bank of the moſt northerly branch of Mohawk river and on the weſt bank of the Hudſon, is ſituated in this townſhip.—*ib.*

HALIFAX, a county in the eaſtern part of the Britiſh province of Nova-Scotia. It contains Halifax, the capital; the townſhips of Londonderry, Truro, Onſlow, Colcheſter, Lawrence, Southampton, Canſo, and Tinmouth. The inhabitants are chiefly Iriſh, Scotch, and New-Englanders. It has numerous bays, and rivers; the chief of the latter are Shabbennacadie, which is a boatable river, the Petitcodiac, Memramcook, &c.—*ib.*

Halifax, the capital of the province of Nova-Scotia, in the county of its name, was ſettled by a number of Britiſh ſubjects in 1749. It is ſituated on a ſpacious and commodious bay or harbour, called Chebucto, of a bold and eaſy entrance, where a thouſand of the largeſt ſhips might ride with great convenience and ſafety. The town is built on the weſt ſide of the harbour, on the declivity of a commanding hill, whoſe ſummit is 236 feet perpendicular from the level of the ſea. The town is laid out into oblong ſquares; the ſtreets parallel and at right angles. The town and ſuburbs are about two miles in length; and the general width a quarter of a mile. It contained in 1793 about 4000 inhabitants and 700 houſes. At the northern extremity of the town, is the king's naval yard, completely built and ſupplied with ſtores of every kind for the royal navy. The harbour of Halifax is reckoned inferior to no place in Britiſh America for the ſeat of government, being open and acceſſible at all ſeaſons of the year, when almoſt all other harbours in theſe provinces are locked up with ice; alſo from its entrance, ſituation, and its proximity to the bay of Fundy, and principal interior ſettlements of the province.

This city, lying on the ſouth coaſt of Nova-Scotia, has communication with Pictou, 68 miles to the north-eaſt on the gulf of St. Lawrence, by a good cart-road, finiſhed in 1792. It is twelve miles northerly of Cape Sambro, which forms in part the entrance of the bay; 27 ſouth-eaſterly of Windſor, 40 N. by E. of Truro, 80 N. E. by E. of Annapolis on the bay of Fundy, and 157 ſouth-eaſt of St. Ann, in New-Brunſwick, meaſuring in a ſtraight line. N. lat. 44° 40′ W. long 63° 15′.—*ib.*

Halifax, a fort in the town of Winſlow, in Lincoln county, Maine, erected by order of Governor Shirley in 1754. It ſtands on the point of land formed by the confluence of the Sebaſtacook with the Kennebeck, 30 miles below Sandy river.—*ib.*

Halifax, a townſhip in Windham county, Vermont, 23 miles E. by S. of Bennington, has Marlborough on the north, and the Maſſachuſetts line ſouth. It contains 1309 inhabitants.—*ib.*

Halifax, a towhſhip in Plymouth county, Maſſachuſetts, ſituated 35 miles ſouth-eaſt of Boſton. It was incorporated in 1734, and contains 664 inhabitants.—*ib.*

Halifax, a village or ſettlement on the eaſt ſide of Suſquehannah river, in Dauphin county, Pennſylvania, 13 miles north of Harriſburg.—*ib.*

Halifax, one of the middle diſtricts of North-Carolina, bounded north by the State of Virginia, eaſt by Edenton diſtrict, weſt by Hillſborough, and ſouth by Newbern. It is divided into 7 counties, viz. Northampton, Halifax, Martin, Edgcomb, Warren, Franklin, and Naſh, which contain 64,630 inhabitants, including 25,402 ſlaves. Beſides ſmaller ſtreams, the Roanoke paſſes through this diſtrict in a ſouth-eaſt courſe, and the Pamplico has its ſource in it. Chief town, Halifax.—*ib.*

Halifax, a county of the above diſtrict, bounded north by Northampton, ſouth by Edgcomb, eaſt by Bertie, and weſt by Warren. It contains 7459 inhabitants, and 6506 ſlaves. Chief town, Halifax.—*ib.*

Halifax, the chief town of the above county, and of the diſtrict of its name in North-Carolina, is a poſt-town, pleaſantly ſituated on the weſtern bank of the Roanoke, about ſix miles below the falls, regularly laid out, and beſides dwelling houſes, has a court-houſe and gaol. It is 36 miles north of Tarborough, 28 miles from Grenville court-houſe, 147 north-eaſt of Fayetteville, 75 S. by W. of Peterſburg, Virginia, and 383 S. W. by S. of Philadelphia, N. lat. 36° 13′.—*ib.*

Halifax, a county in Virginia, bordering on the State of North-Carolina. It is about 42 miles long and 39 broad, and contains 14,722 inhabitants, including 5565 ſlaves.—*ib.*

HALLOWELL, a flouriſhing poſt-town in the Diſtrict of Maine, and the ſhire town of Lincoln county, ſituated in N. lat. 44° 16′, at the head of the tide waters on the weſt ſide of Kennebeck river. An academy is eſtabliſhed here with a conſiderable fund in lands. The court-houſe here is 12 miles S. by W. of Vaſſalborough, 30 N. by W. of Wiſcaſſet, 40 north-eaſt of New-Glouceſter, and 195 N. by E. of Boſton. *Hallowell Hook* lies on the ſame ſide of the river, three miles below the town, and five north of Pittſton. The whole townſhip contains 1194 inhabitants.—*ib.*

HAMBATO, a principal aſſiento or juriſdiction in the province of Quito, in Peru. It is ſituated in 1° 41′ S. lat. and 12 miles weſt of the city of Quito; and has 6 ſmall villages in its dependence. It contains about 18,000 inhabitants, who are moſtly employed in weaving ſtuffs, and in knitting.—*ib.*

HAMBDEN, or *Hamden*, a townſhip in New-York State, bounded north by land ceded to Maſſachuſetts, ſouth by the north line of Pennſylvania, and eaſt by Sidney. Suſquehannah river paſſes in a weſt courſe through both towns. The centre of the town lies 13 miles W. by S. of the mouth of Chenengo river.—*ib.*

HAMBURG, a ſmall poſt town of New-Jerſey, 18 miles from Goſhen in New-York, and 20 from Newtown or Suſſex court-houſe.—*ib.*

Hamburg, a handſome town in Burke's county, Pennſylvania, ſeated on the eaſt ſide of Schuylkill. Here are about 50 or 60 houſes, a German Lutheran and Calviniſt church united. It is 18 miles N. by W. of Reading, and 70 north-north-weſt of Philadelphia. North lat. 40° 34′, weſt long. 76°.—*ib.*

HAMDEN, a townſhip in New-Haven county, Connecticut, about eight miles north of New-Haven city.—*ib.*

HAMILTON, a cape on the north end of Newfoundland iſland.—*ib.*

Hamilton. There are three townſhips of this name in Pennſylvania; one in each of the counties of York, Franklin, and Northampton.—*ib.*

Hamilton, a ſettlement in Vermont on the Canada line.—*ib.*

Hamilton, in Herkemer county, New-York, a townſhip 12 miles ſquare, 20 ſouth of old Fort Schuyler, a level townſhip of good land, faſt ſettling.—Oriſkè or Olhiſke creek, a water of Mohawk, and Chenung, a water of Suſquehannah, riſe in this townſhip. In 1796 there were 1202 inhabitants, of whom 196 were electors.—*ib.*

Hamilton, a town or ſettlement lately laid out in Albany county, New-York, in the extenſive townſhip of Water Vliet, formerly called the *Glaſs Factory;* and has its preſent name in honour of that great patron of American manufactures, the late ſecretary of the treaſury of the United States of America. It lies 10 miles weſt of Albany, two miles from the Schenectady road; and is one of the moſt deciſive efforts of private enterprize in the manufacturing line, as yet exhibited in the United States. The glaſs manufactury is now ſo well eſtabliſhed, and ſo happily ſituated for the ſupply of the northern and weſtern parts of the State of New-York, as well as Vermont and Canada, that it is to be expected the proprietors will be amply rewarded for their great and expenſive exertions. The glaſs is in good reputation. Here are two glaſs houſes, and various other buildings, curious hydraulic works, to ſave manual labour, by the help of machinery. A copious ſtream runs through the heart of the ſettlement which lies high; and being ſurrounded by pine plains, the air is highly ſalubrious. The great Schoharie road traverſes the ſettlement. A ſpacious ſchoolhouſe, and a church of an octagon form are ſoon to be erected.

In the neighbourhood of theſe glaſs works, a block was cut out of an ancient tree, not many years ago, containing evident marks of an axe or ſome edge tool, made 185 years ago, determined according to the uſual and certain mode of aſcertaining the age of trees. The block is preſerved in Albany as a curioſity. Henry Hudſon aſcended the river which bears his name, as high as Albany, in the autumn of 1609, 187 years ago, and theſe marks were probably made by ſome of his men.—*ib.*

Hamilton Ford lies near the mouth of Bullock's Creek in North-Carolina. This was the route purſued by Tarleton, after his defeat at Cowpens, in January, 1781.—*ib.*

Hamilton, a diſtrict in the State of Tenneſſee, ſituated on the waters of the Holſton and Clinch; bounded ſouth by Tenneſſee river, and ſeparated from Mero diſtrict on the weſt by an uninhabited country. It contains the counties of Knox, Jefferſon, Blount, Sevier and Grainger.—*ib.*

Hamilton, a county of the N. W. Territory, erected Jan. 2, 1790, "beginning on the bank of the Ohio river, at the confluence of the Little Miami; and down the ſaid Ohio river to the mouth of the big Miami, and up ſaid Miami to the Standing Stone Forks, or branch of ſaid river; and thence with a line to be drawn due E. to the Little Miami, and down ſaid little Miami river, to the place of beginning."—*ib.*

Hamilton Fort, ſtands on the eaſt ſide of the Great Miami, in the N. W. Territory; 25 miles ſouth of Fort St. Clair, and 25 north of Cincinnati. It is a ſtockaded fort, capable of containing 200 men. The ſituation is as advantageous for defence as pleaſing to the eye. It is built upon a narrow neck of land, commanding the Miami on the north-weſt, and a praire and ſheet of water on the north-eaſt, about a mile wide, and 2½ miles long. The ſoil near it is rich and fertile; and forage may be got by repeated mowings of natural graſs.—*ib.*

Hamilton, a port in the Bermuda Iſlands.—*ib.*

HAMMEL'S TOWN, a town in Dauphine county, Pennſylvania, five miles from Suſquehannah river, and 85 from Philadelphia. It contains a German church, and about 35 dwelling houſes.—*ib.*

HAMPSHIRE, an extenſive, populous, and wealthy county in Maſſachuſetts, made a ſhire in 1662. It is in many parts mountainous and hilly, and extends acroſs the State from north to ſouth; bounded north by the States of New-Hampſhire and Vermont, ſouth by the State of Connecticut, eaſt by Worceſter county, and weſt by Berkſhire. It contains 60 townſhips, 9181 houſes, 9617 families, and 59,681 inhabitants. Its principal towns lie on both ſides of Connecticut river, which interſects it from north to ſouth. Theſe are Springfield, Weſt-Springfield, Northampton, Hadley, Hatfield, Deerfield, and Northfield. It is generally of a fertile ſoil, and produces the neceſſaries of life, and ſome of its luxuries in great plenty.—*ib.*

Hampshire, a county in Virginia, bounded N. and N. W. by the Patowmack river, which divides it from the State of Maryland. It is about 60 miles long and 50 broad, and contains 7346 inhabitants, including 454 ſlaves. It is well watered by Patowmack and its ſouth branch. Iron ore and coals have been diſcovered on the banks of this river. Chief town, Romney.—*ib.*

HAMPSTEAD, a town in Rockingham county, New-Hampſhire, about 34 miles weſterly of Portſmouth. It was incorporated in 1749, and contained in 1775, 768 inhabitants; in 1790, 724.—*ib.*

Hampstead, a town on Long Iſland, New-York, nine miles eaſterly of Jamaica, and 23 miles eaſtward of New-York city. In this town is an extenſive and remarkable plain called *Hampſtead Plain.*—*ib.*

Hampstead, a village in Georgia, about four miles from Savannah, and about a mile from another village called Highgate. The inhabitants are gardeners, and ſupply the town with greens, pot herbs, roots, &c.—*ib.*

HAMPTON, a townſhip in Windham county, Connecticut, three miles north-eaſt of Windham, of which it was formerly a pariſh, but lately incorporated.—*ib.*

Hampton, East, a townſhip in Hampſhire county, Maſſachuſetts, containing 457 inhabitants, and ſituated 105 miles weſt of Boſton. It was incorporated in 1785.—*ib.*

Hampton, East, on the eaſt end of Long-Iſland, (New-York) a half ſhire town of Suffolk county. It has 3260 inhabitants; and in it is Clinton Academy, which in 1795 had 92 ſtudents.—*ib.*

Hampton, a townſhip on the ſea coaſt of New-

Hampſhire, on the eaſtern ſide of Rockingham county, and called *Winicumet* by the Indians. It was ſettled under Maſſachuſetts, and incorporated in 1638. In 1775 it contained 862 inhabitants, and in 1790, 853. It is 12 or 14 miles S. by W. of Portſmouth, and 8 ſouth-eaſt of Exeter. In 1791, a canal was cut through the marſhes in this town, which opens an inland navigation from Hampton through Saliſbury into Merrimack river for about eight miles; loaded boats may paſs through it with eaſe and ſafety.—*ib.*

HAMPTON FALLS, a ſmall town taken from the above town, lying on the road which leads from Exeter to Newbury-Port, ſix miles ſouth-eaſterly of the former, and eight northerly of the latter. In 1775 it contained 645, and in 1790, 541 inhabitants. It was incorporated in 1712.—*ib.*

HAMPTON, a townſhip in the northern part of Waſhington county, New-York, having Skeenſborough on the weſt. It has 463 inhabitants, of whom 107 are electors.—*ib.*

HAMPTON, the capital of Elizabeth county, in Virginia, alſo a port of entry, and poſt town, ſituated at the head of a bay which runs up north from the mouth of James river, called *Hampton Road*, five miles north-weſt of Point Comfort. It contains about 30 houſes, an epiſcopal church, a court-houſe and gaol. The value of its exports of grain, lumber, ſtaves, &c. amounted to 41,997 dollars in one year, ending September 30, 1794. This town was anciently called *Kecoughton* by the Indians. It is 18 miles north of Norfolk, 22 ſouth-eaſt of Yorktown, 93 eaſt-ſouth-eaſt of Richmond, and 205 W. by S. of Philadelphia.—*ib.*

HANCES, HANCHES, HAUNCHES, or *Hanſes*, in architecture, are certain ſmall intermediate parts of arches between the key or crown and the ſpring at the bottom, being perhaps about one-third of the arch, and ſituated nearer the bottom than the top or crown; and are otherwiſe called the *ſpandrels*. See ARCH in this *Supplement*.

HANCOCK's HARBOUR, called by the Indians *Clioquot*, is ſituated about 20 leagues eaſt-ſouth-eaſt of Nootka, in N. lat. 48° 30′, weſt long. from Greenwich 125° 26′. The entrance of this harbour is about five miles in length, and has good anchorage; about it are ſcattered a number of iſlands, and ſeveral ſand-banks or ſpits. It has alſo a number of fine coves. The land round the harbour is generally uneven, rocky and mountainous; covered however with pine, fir, ſpruce, cedar, hemlock, cypreſs and other trees of a remarkable ſize. The climate here is much milder than in the ſame latitude on the eaſtern ſide of the continent; the froſt in winter being ſeldom ſo ſevere as to prevent vegetation. An eaſterly wind is conſidered here is a prognoſtic of a ſtorm, and weſt winds bring fair weather. Deer, racoons, wolves, bears, ſquirrels, martins, land otters, beaver, and wild cats are the animals which inhabit the foreſts. The amphibious animals are the common ſeal, and the ſea-otter. The ſkin of the latter is very valuable. The inhabitants are ſaid to be cannibals. This and other places of the ſame name have their appellation in honour of the late Governor Hancock, of Maſſachuſetts.—*Morse.*

HANCOCK, a river of Waſhington iſland, on the north-weſt coaſt of North-America, called *Maſheet* by the Indians, diſcovered by Captain Crowell in 1791. It empties into the ſea from the north end of the largeſt iſland. At its mouth it is nearly two and a half nautical miles wide; and a conſiderable ſize ten miles up. It has at its mouth five fathoms water, gradually increaſing in breadth; and for 7½ miles up, to Gooſe Iſland, has not leſs than ten fathoms. Captain Ingraham examined it about 12 miles; but by the information of the natives, he judged that it communicates with Skitikiſs Bay, or near it, on the eaſt ſide of the iſlands. It is by far the moſt eligible for a new ſettlement of any place the Captain had ſeen on the coaſt. The land is low and apparently very fertile: and the river abounds with ſalmon. Were a good houſe erected on ſome of the pleaſant ſpots it would have every appearance of being long ſettled. Beautiful buſhes and graſs occupy the ſkirts of the woods. The mouth of the river is in north lat. 54° 7′, weſt long. 131° 54′.—*ib.*

HANCOCK, a townſhip in Addiſon county, Vermont.—*ib.*

HANCOCK, a large maritime county of the Diſtrict of Maine, bounded north by Lower Canada, ſouth by the ocean, eaſt by Waſhington county, and weſt by Lincoln county. It is 190 miles long from north to ſouth, and nearly 60 broad. It contains 24 townſhips and plantations; of which Penobſcot and Caſtine are the chief. The number of inhabitants is greatly increaſed ſince 1790. At that time there were 9549 ſouls. It is remarkably well watered by Penobſcot river, and its branches, Union river, and other ſmaller ſtreams. The northern part of the county ſends its waters in one ſtream from numerous branches in a N. E. courſe to St. John's river. On the ſea-coaſt are many harbours and inlets, hid by a multitude of fertile iſlands; the largeſt of theſe in a S. W. direction from Goldſborough, are Mount Deſart, Swan Iſles, Vinal Haven, Haut Iſle, Deer and Iſleſborough; all ſituated in Penobſcot Bay. Great part of the county is yet unſettled. The towns along the ſea coaſt, and on the banks of Penobſcot and Union rivers, are the moſt fertile and populous. Caſtine is the ſhire town.—*ib.*

HANCOCK, a townſhip in Lincoln county, Maine, emboſomed by the Kennebeck and Sebaſticook rivers, bounded N. W. by Canaan, and 7 miles north of the confluence of the two rivers. It contains 278 inhabitants.—*ib.*

HANCOCK, a townſhip in Hillſborough county, New-Hampſhire, ſituated between two weſtern branches of Contoocook river, 14 miles eaſt of Keene, and between 60 and 70 W. by S. of Portſmouth. It was incorporated in 1779, and contains 634 inhabitants.—*ib.*

HANCOCK, a long, narrow and mountainous townſhip on the New-York line, in Berkſhire county, Maſſachuſetts, having the towns of Laneſborough and Partridgefield on the northward, and Pittsfield on the S. It was incorporated in 1776, has 1211 inhabitants, and lies 20 miles N. by W. of Lenox, and 150 W. of Boſton.—*ib.*

HANCOCK, a ſmall poſt town of Maryland, ſituated in Waſhington county, on the N. bank of Patowmack river, between Conolowy and Little Conolowy creeks, about 25 miles S. E. of Bedford in Pennſylvania,

nia, 34 N. E. of Old Town in Maryland, and 119 N. W. of Baltimore.—*ib.*

Hancock, a new county in the upper diſtrict of Georgia.—*ib.*

HANNAH Bay *Houſe*, a factory of the Hudſon's Bay Company, at the ſouth end of James' Bay in North America, and on the eaſtern ſide of Harricanaw river, 45 miles E. by S. of Mooſe Fort, and 18 below a houſe on the ſame river.—*ib.*

Hannah's Town, in Weſtmoreland county, Pennſylvania, 4 miles N. N. E. of Greenſburg, and on the road from Bedford to Pittſburg; 54 miles N. W. by W. of the former, and 26 eaſt of the latter.—*ib.*

HANNIBAL, a military townſhip in the State of New-York, on Lake Ontario, 10 miles S. by W. of Fort Oſwego.—*ib.*

HANOVER, a bay in the ſea of Honduras, ſituated on the eaſt ſide of the peninſula of Yucatan, from which it receives the waters of the Rio Honde. The tract of land between the river Honde and the Balize was ceded by the Spaniſh king to the king of Great Britain, at the peace of 1783, for the purpoſe of cutting and carrying away logwood.—*ib.*

Hanover, a townſhip in Luzerne county, Pennſylvania. Alſo a townſhip in Waſhington county. Eaſt and Weſt Hanover, are two townſhips in Dauphine county in the ſame State.—*ib.*

Hanover, or *McAlliſter's Town*, a poſt town in York county, Pennſylvania, ſituated between Cadorus creek, and a branch of Little Conewago, which flows into the Suſquehannah. It contains nearly 300 dwelling houſes, and a German and Lutheran church. It is 7 miles north of the Maryland line, 18 miles ſouthweſt of York, and 106 W. by S. of Philadelphia.—*ib.*

Hanover, a townſhip in Plymouth county, Maſſachuſetts, 25 miles S. E. from Boſton, was incorporated in 1727, and contains 1,083 inhabitants.—*ib.*

Hanover, a poſt-town of New-Hampſhire, ſituated on the eaſt ſide of Connecticut river in Grafton county. *Dartmouth College*, in this town, is ſituated on a beautiful plain, about half a mile, from the river, in 43° 43′ N. lat. and in 72° 14′ W. long. from Greenwich. It derives its name from William Earl of Dartmouth, one of its principal benefactors, and was founded in the year 1769 by the late Dr Eleazer Wheelock. The funds of the college conſiſt chiefly of lands, amounting to about 80,000 acres, which are increaſing in value in proportion to the growth of the country; 1,200 acres lie contiguous to the college; and are capable of the beſt improvement; 12,000 lie in Vermont. A tract of 8 miles ſquare was granted by the aſſembly of New-Hampſhire in 1789. The revenue of the college ariſing from the lands, in 1793, amounted annually to £140. By contracts then made, they would amount, in four years after, to £450; and in 12 years, to 650. The income from tuition is about £600 per annum. The number of under-graduates is, on an average, from 150 to 180. A grammar ſchool of about 50 or 60 ſcholars is annexed to the college. The ſtudents are under the immediate government and inſtruction of a preſident, who is alſo profeſſor of hiſtory, a profeſſor of mathematics, and natural philoſophy, a profeſſor of languages, and two tutors. The college is furniſhed with a handſome library and a philoſophical apparatus tolerably complete. A new college edifice of wood, 150 by 50 feet, and three ſtories high, was erected in 1786, containing 36 rooms for ſtudents. Its ſituation is elevated, healthful and pleaſant, commanding an extenſive proſpect to the weſt. There are three other public buildings, belonging to the college, and a handſome congregational meeting houſe has lately been erected, in which the commencement exerciſes are exhibited. It is 32 miles north of Charleſton, 115 N. W. by W. of Portſmouth, 138 N. W. of Boſton, and 378 N. E. by N. of Philadelphia.—*ib.*

Hanover, a townſhip in Morris county, New-Jerſey. In a ridge of hills in this townſhip are a number of wells, 40 miles from the ſea in a ſtraight line, which regularly ebb and flow about 6 feet twice in every 24 hours. It is about 16 miles N. W. of Elizabeth-Town, and joins upon Morriſtown.—*ib.*

Hanover, a county of Virginia, lying between Pamunky and Chickahominy rivers. Its length is about 48 miles, and its breadth 22; and contains 14,754 inhabitants, including 8,223 ſlaves. It abounds with lime-ſtone.—*ib.*

Hanover, a ſmall town of Virginia, of the above county, ſituated on the weſt ſide of the Pamunky, in which is an academy. It is 6 miles from Newcaſtle, 22 N. E. by E. of Richmond, and 110 N. N. W. of Waſhington city.—*ib.*

HANSPIKE, or Handspec, a lever or piece of ſtrong wood, for raiſing by the hand great weights, &c. It is five or ſix feet long, cut thin and crooked at the lower end, that it may get the eaſier between things that are to be ſeparated, or under any thing that is to be raiſed. It is better than a crow of iron, becauſe its length allows a better poiſe.

HANTS, a county of Nova-Scotia, beginning about 30 miles from Halifax, contains the townſhips of Windſor, Falmouth, and Newport; ſeveral valuable tracts remain unſettled. The road from Halifax runs part of the way between Windſor and Newport, and has ſettlements on it at ſmall diſtances. The county is about 20 miles ſquare, and is well watered. The rivers St. Croix, Kenetcoot, and Cocmiguen empty into the Avon, and are all navigable except the laſt. The Cacaguet and Cobeguit are navigable 40 miles for veſſels of 60 tons.—*Morſe.*

HARDIN, a new county in the State of Kentucky, bounded N. E. by Waſhington and Lincoln, N. W. and W. by Nelſon and Greene, and S. E. by Logan counties.—*ib.*

HARDWICK, a townſhip in Caledonia county, in Vermont.—*ib.*

Hardwick, a townſhip in Worceſter county, Maſſachuſetts, 25 miles N. W. of Worceſter, and 70 S. W. of Boſton. It is ſeparated from New-Braintree and Ware by Ware river. There are within this town 245 houſes, 1,725 inhabitants, 5 corn and 4 ſaw mills, and two clothiers' works.—*ib.*

Hardwick, a townſhip in Suſſex county, New-Jerſey, nearly 10 miles S. W. of Newton.—*ib.*

Hardwick, a ſmall town of Georgia, at the mouth of Ogeeche river, and about 18 miles S. by W. of Savannah. It has lately been made a port of entry.—*ib.*

HARDY, a county of Virginia, bounded north by Hampſhire. It is about 60 miles long, and 40 in breadth, and contains 7,336 inhabitants, including 369 ſlaves. Chief town, Moorfield.—*ib.*

HARDYSTON, a townſhip in Suſſex county, New-Jerſey, containing 2,393 inhabitants, including 26 ſlaves.—*ib.*

HARFORD *County*, in Maryland, is bounded north by York county in Pennſylvania; eaſt by Suſquehannah river and Cheſapeak Bay. The chief waters within the county are Buſh river and Deer creek; on which are 16 mills of different kinds. On the former and its branches are the towns of Harford, Abington, Coopſtown, and Belle-Air. The other towns are Havre de Gras at the mouth of Suſquehannah, and Joppa below the forks of Gunpowder.

It contains 14,976 inhabitants, including 3,417 ſlaves. Chief town, Belle-Air.—*ib.*

HARFORD, or *Buſh-town*, in Harford county, Maryland, lies at the head of the tide waters of Buſh river, between Binam's and James's runs; the former ſeparating it from Abington. It has few houſes, and is falling to decay ſince the courts of juſtice have been removed to Belle-Air. It is 9 miles S. E. of Belle-Air, and 25 N. E. by E. of Baltimore.—*ib.*

HARLEM, a townſhip in Lincoln county, Maine, incorporated in 1796. It was formerly called *Jones's Plantation*.—*ib.*

HARLEM, or *Eaſt River*, a river which connects Long-Iſland Sound with North, or Hudſon river, and forms York-Iſland.—*ib.*

HARLEM, a diviſion of New-York county in the northern part of York-Iſland, which contains 803 inhabitants, including 189 ſlaves. The village of its name ſtands 9 miles northerly of New-York city, and 4 S. W. of Weſt-Cheſter. It is oppoſite to the weſt end of Hell Gate.—*ib.*

HARMAN's *Station*, in Kentucky, is a fort on the eaſt ſide of the weſt branch of Big Sandy river. On the oppoſite ſide of this branch is the Great Salt ſpring. Harman's Station is about 20 miles ſouth of Vancouver's fort.—*ib.*

HARMAR, a well conſtructed fort in the N. W. Territory, ſituated at the mouth of the Muſkingum. It has 5 baſtions, and 3 cannon mounted, and is garriſoned by 4 companies. It is conveniently ſituated to reinforce any of the poſts up or down the river Ohio. The place is remarkably healthy.—*ib.*

HARMONY, a village in Luzerne county, Pennſylvania, cloſe on the line of New-York, on the north ſide of Starucca creek, a water of the eaſt branch of Suſquehannah river. Between this and Stockport on Delaware river, diſtant 18 miles E. S. E. there is a portage. It is about 140 miles N. by W. of Philadelphia, and 130 N. W. of New-York. N. lat. 41° 58′.—*ib.*

HARPATH, a ſmall boatable river in Tenneſſee, which, after a N. N. W. courſe of about 40 miles, falls into Cumberland river, 19 miles N. W. of Naſhville.—*ib.*

HARPERSFIELD, a townſhip in Otſego county, in New-York, bounded S. W. by Unadilla townſhip, and 32 miles S. E. of Cooperſtown; 155 of its inhabitants are electors. Through this town runs the great poſt-road from Hudſon to Williamſburgh, 62 miles weſt of Hudſon city.—*ib.*

HARPLE, a townſhip in Delaware county, Pennſylvania.—*ib.*

HARPSWELL, a townſhip in Cumberland county, Diſtrict of Maine, incorporated in 1758, and contains 1071 inhabitants. It is bounded eaſterly by Georgetown; from which it is ſeparated by a navigable river. The people here are opening a communication by a canal between the waters of Kennebeck river and thoſe of Caſco Bay, through the arm of the ſea called Stevens's river. The point called Merryconeag, projecting itſelf into the bay together with the iſland Sebaſcodeagan, and ſeveral other ſmall iſlands, are incorporated and form this townſhip. The waters round this iſland extend to within two miles of the waters of the Kennebeck, and thus form what is called ſmall Point.—*ib.*

HARRINGTON, a townſhip in Bergen county, New-Jerſey.—*ib.*

HARRIOT (Thomas) was a very eminent mathematician of the 16th and 17th centuries, of whom ſome account has been given in the *Encyclopædia*. In that article it has been ſhewn, that Des Cartes had ſeen ſome improvements of Harriot's in algebra, and publiſhed them to the world as his own; but this piece of plagiariſm has been more completely proved in the Aſtronomical Ephemeris for the year 1788, by Dr Zach, aſtronomer to the Duke of Saxe-Gotha; who likewiſe ſhews that Harriot was an aſtronomer as well as an algebraiſt.

"I here preſent to the world (ſays the Doctor) a ſhort account of ſome valuable and curious manuſcripts, which I found in the year 1784 at the ſeat of the earl of Egremont, at Petworth in Suſſex.

"A predeceſſor of the family of lord Egremont, viz. that noble earl of Northumberland, named Henry Percy, was not only a generous favourer of all good learning, but alſo a patron and Mæcenas of the learned men of his age. Thomas Harriot, the author of the ſaid manuſcripts, Robert Hues (well known by his Treatiſe upon the Globes), and Walter Warner, all three eminent mathematicians, who were known to the earl, received from him yearly penſions; ſo that when the earl was committed priſoner to the Tower of London in the year 1606, our author, with Hues and Warner, were his conſtant companions: and were uſually called the earl of Northumberland's three Magi.

"Thomas Harriot is a known and celebrated mathematician among the learned of all nations, by his excellent work, *Artis Analyticæ Praxis, ad æquationes algebraicas nova expedita & generali methodo, reſolvendas, Tractatus poſthumus:* Lond. 1631: dedicated to Henry earl of Northumberland; publiſhed after his death by Walter Warner. It is remarkable, that the fame and the honour of this truly great man were conſtantly attacked by the French mathematicians, who could not endure that Harriot ſhould in any way diminiſh the fame of their Vieta and Des Cartes, eſpecially the latter, who was openly accuſed of plagiariſm from our author.

"Des Cartes publiſhed his Geometry ſix years after Harriot's work appeared, viz. in the year 1637. Sir Charles Cavendiſh, then ambaſſador at the French court at Paris, obſerved to the famous geometrician Roverval, that theſe improvements in analyſis had been already made theſe ſix years in England, and ſhewed him afterwards Harriot's *Artis Analyticæ Praxis*; which, as Roverval was looking over, at every page he cried out, *Oui! oui! il l'a vu! Yes! yes! he has ſeen it!* Des Cartes had alſo been in England before Harriot's death, and had heard of his new improvements and inventions in analyſis.

“ Now all this relates to Harriot the celebrated analyſt; but it has not hitherto been known that Harriot was an eminent aſtronomer, both theoretical and practical, which firſt appears by theſe manuſcripts; among which, the moſt remarkable are 199 obſervations of the ſun's ſpots, with their drawings, calculations, and determinations of the ſun's rotation about his axis. There is the greateſt probability that Harriot was the firſt diſcoverer of theſe ſpots, even before either Galileo or Scheiner. The earlieſt intelligence we have of the firſt diſcovered ſolar ſpots is of one Joh. Fabricius Phryſius, who in the year 1611 publiſhed at Wittemberg a ſmall treatiſe, intitled, *De Maculis in Sole obſervatis & apparente eorum cum Sole converſione narratio.* Galileo, who is commonly accounted the firſt diſcoverer of the ſolar ſpots, publiſhed his book, *Iſtoria e Dimonſtrazioni intorne alle Machie Solare e loro accidenti,* at Rome in the year 1613. His firſt obſervation in this work is dated June 2d 1612. Angelo de Filiis, the editor of Galileo's work, who wrote the dedication and preface to it, mentions, page 3. that Galileo had not only diſcovered theſe ſpots in the month of April in the year 1611, at Rome, in the Quirinal Garden, but had ſhewn them ſeveral months before (*molti meſi inanzi*) to his friends in Florence; and that the obſervations of the diſguiſed Apelles (the Jeſuit Scheiner, a pretender to this firſt diſcovery) were not later than the month of October in the ſame year; by which the epoch of this diſcovery was fixed to the beginning of the year 1611. But a paſſage in the firſt letter of Galileo's works, pa. 11. gives a more preciſe term to this diſcovery. Galileo there ſays in plain terms, that he had obſerved the ſpots in the ſun 18 months before. The date of this letter is May 24. 1612; which brings the true epoch of this diſcovery to the month of November 1610. However, Galileo's firſt produced obſervations are only from June 2. 1612, and thoſe of father Scheiner of the month of October in the ſame year. But now it appears from Harriot's manuſcripts, that his firſt obſervations of theſe ſpots are of Dec. 8. 1610. It is not likely that Harriot could have this notice from Galileo, for I do not find this mathematician's name ever quoted in Harriot's papers: But I find him quoting book i. chap. 2. of Joſeph a Coſta's *Natural and Moral Hiſtory of the Weſt Indies;* in which he relates, that in Peru there are ſpots to be ſeen in the ſun which are not ſeen in Europe: and hence it is probable, that Harriot took the hint of looking for ſuch ſpots. Beſides, it is not unlikely, that living with ſo munificent a patron, Harriot got from Holland the new invented teleſcopes much ſooner than they could reach Galileo, who at the time lived at Venice. Harriot's very careful and exact obſervations of theſe ſpots, ſhew alſo that he was in poſſeſſion of the beſt and moſt improved teleſcopes of that time; for it appears he had ſome with magnifying powers of 10, 20, and 30 times. At leaſt there are no earlier obſervations of the ſolar ſpots extant than his; they run from December 8. 1610, till January 18. 1613. I compared the correſponding ones with theſe obſerved by Galileo, between which I found an exact agreement. Had Harriot had any notion about Galileo's diſcoveries, he certainly would have alſo known ſomething about the phaſes of Venus and Mercury, and eſpecially about the ſingular ſhape of Saturn, firſt diſcovered by Galileo; but I find not a word in all his papers concerning the particular figure of that planet.

“ I found likewiſe, (continues Dr Zach) among the papers of Harriot a large ſet of obſervations on the ſatellites of Jupiter, with drawings of them, their poſitions, and calculations of their revolutions and periods. His firſt obſervation of thoſe diſcovered ſatellites, I find to be of January 16. 1610; and they go till February 26. 1612. Galileo pretends to have diſcovered them January 7. 1610; ſo that it is not improbable that Harriot was likewiſe the firſt diſcoverer of theſe attendants of Jupiter.

“ Among his other obſervations of the moon, of eclipſes, of the planet Mars, of ſolſtices, of refraction, of the declination of the needle, &c. there are remarkable ones of the comet of 1607, and the latter comet (for there were two) of 1618. They were all obſerved with a croſs-ſtaff, by meaſuring their diſtances from fixed ſtars; whence theſe obſervations are the more valuable, as comets had before been but groſsly obſerved. Kepler himſelf obſerved the comet of 1607 only with the naked eye, pointing out its place by a coarſe eſtimation, without the aid of an inſtrument; and the elements of their orbits could, in defect of better obſervations, be only calculated by them. The obſervations of the comet of the year 1607 are of the more importance, even now for modern aſtronomy, as this is the ſame comet that fulfilled Dr Halley's prediction of its return in the year 1759. That prediction was only grounded upon the elements afforded him by theſe coarſe obſervations; for which reaſon he only aſſigned the term of its return to the ſpace of a year. The very intricate calculations of the perturbations of this comet, afterwards made by M. Clairaut, reduced the limits to a month's ſpace. But a greater light may now be thrown upon this matter by the more accurate obſervations on this comet by Mr Harriot. In the month of October 1785, when I converſed upon the ſubject of Harriot's papers, and eſpecially on this comet, with the celebrated mathematician M. de la Grange, director of the Royal Academy of Sciences at Berlin, he then ſuggeſted to me an idea, which, if brought into execution, will clear up an important point in aſtronomy. It is well known to aſtronomers how difficult a matter it is to determine the maſs, or quantity of matter, in the planet Saturn; and how little ſatisfactory the notions of it are that have hitherto been formed. The whole theory of the perturbations of comets depending upon this uncertain datum, ſeveral attempts and trials have been made towards a more exact determination of it by the moſt eminent geometricians of this age, and particularly by la Grange himſelf; but never having been ſatisfied with the few and uncertain data heretofore obtained for the reſolution of this problem, he thought that Harriot's obſervations on the comet of 1607, and the modern ones of the ſame comet in 1759, would ſuggeſt a way of reſolving the problem *à poſteriori;* that of determining by them the elements of its ellipſis. The retardation of the comet compared to its period, may clearly be laid to the account of the attraction and perturbation it has ſuffered in the region of Jupiter and Saturn; and as the part of it belonging to Jupiter is very well known, the remainder muſt be the ſhare which is due to Saturn; whence the maſs of the latter may be inferred. In conſequence of this conſideration, I have already begun to reduce moſt of Harriot's obſervations of this comet, in order to calculate by them the true elements of its orbit on an elliptical hypotheſis, to complete M. de la Grange's idea upon this matter.

"I forbear to mention here any more of Harriot's analytical papers, which I found in a very great number. They contain ſeveral elegant ſolutions of quadratic, cubic, and biquadratic equations; with ſome other ſolutions and *loca geometrica,* that ſhew his eminent qualifications, and will ſerve to vindicate them againſt the attacks of ſeveral French writers, who refuſe him the juſtice due to his ſkill and accompliſhments, merely to ſave Des Cartes's honour, who yet, by ſome impartial men of his own nation, was accuſed of public plagiariſm."

HARRISBURG, a poſt-town, and the capital of Dauphine county, Pennſylvania, is ſituated on the N. E. bank of Suſquehannah river. It is laid out regularly, and contains about 300 houſes; of which ſeveral are neat and convenient; ſome of brick and others of ſtone. In 1789, it contained 130 houſes, a ſtone gaol, and a German church. At that period it had been ſettled about 3 years. It is 107 miles W. N. W. of Philadelphia, 53 W. S. W. of Reading, and 17 E. N. E. of Carliſle. N. lat. 40° 16'.—*Morſe.*

HARRISON, a townſhip in Weſt-Cheſter county, New-York, containing 1004 inhabitants; of whom 115 are electors, and 54 ſlaves.—*ib.*

HARRISON, a county in the weſtern part of Virginia, bounded N. by Ohio county, N. E. by Monongalia, S. by Greenbriar, and S. W. by Kenhawa. Its length is about 120 miles, its breadth 80; and the number of inhabitants 2,080, including 67 ſlaves. Chief town Clarkſburg.—*ib.*

HARRISON, a new county in the N. E. part of the State of Kentucky, N. of Bourbon.—*ib.*

HARRODSBURG, or *Harrodſtown;* a poſt-town in Mercer county, Kentucky, at the head of Salt river, which contains about 20 houſes, and is 10 miles S. W. of Danville, 30 S. by W. of Frankfort, and 825 S. W. of Philadelphia.—*ib.*

HARTFORD, a townſhip in Windſor county, Vermont, on Connecticut river, oppoſite the town of Lebanon, in New-Hampſhire. It contains 988 inhabitants.—*ib.*

HARTFORD, a townſhip on the eaſt bank of Geneſſee river, in New-York State, 40 miles W. of Geneva, and 67 S. E. by E. of Fort Niagara.

HARTFORD, a fertile and populous, though hilly county, in Connecticut, bounded N. by the State of Maſſachuſetts; S. by part of Middleſex and New-Haven counties; E. by Tolland, and W. by Litchfield county. It is about 34 miles from N. to S. and its greateſt breadth from E. to W. is 30 miles. It is divided into 15 townſhips, and contains 38,029 inhabitants, including 263 ſlaves. Chief town, Hartford city.—*ib.*

HARTFORD *City,* the capital of Connecticut, lies on the weſt bank of Connecticut river, in the county and townſhip of its own name, 50 miles north-weſterly from the mouth of the river, at Saybrook Bar, in Long Iſland Sound; and thus far the tide flows. The townſhip is 6 miles ſquare, bounded N. by Windſor, N. E. by Eaſt-Windſor, W. by Farmington, E. by Eaſt-Hartford, S. E. by Glaſtenbury, and S. by Wethersfield. The town is divided by a ſmall ſtream called Little River, with high romantic banks, over which is a bridge connecting the two diviſions of the town. The city is regularly laid out, the ſtreets interſecting each other at right angles. Its buildings are an elegant ſtate-houſe, lately built, 2 churches for Congregationaliſts, 1 for Epiſcopalians, and between 400 and 500 dwelling-houſes; a number of which are handſomely built with brick. The inhabitants amount to upwards of 4,000. A bank was incorporated in 1792, with 100,000 dollars capital, number of ſhares 250. The corporation have the power to extend their capital to 500,000 dollars. A woollen manufactory was eſtabliſhed here and encouraged by the State, but has not ſucceeded. The town is advantageouſly ſituated for trade, has a fine back country, enters largely into the manufacturing buſineſs, and is a rich, flouriſhing, commercial town.

This town was firſt ſettled in the year 1636, by Mr Haynes and Mr Hooker, who, with their adherents, removed from Maſſachuſetts. The Dutch had then a trading houſe at the confluence of Mill and Connecticut rivers. They ſoon relinquiſhed the ſettlement, and their lands were confiſcated by a commiſſion from the Commonwealth of England in 1653. A point of land, which formed part of their poſſeſſions, is ſtill called Dutch Point. It is 40 miles N. E. by N. of New-Haven, 55 N. W. of New-London, 124 S. W. of Boſton, 128 N. E. of New-York, 223 N. E. of Philadelphia, 502 from Richmond, 376 from Waſhington city, 1044 from Auguſta, and 1018 from Frankfort in Kentucky. N. lat. 41° 44', W. long. 73° 4'.—*ib.*

HARTLAND, a townſhip of Connecticut, the north-eaſternmoſt in Litchfield county.—*ib.*

HARTLAND, a townſhip in Windſor county, Vermont, ſituated on the weſt bank of Connecticut river, 11 miles below the 15 mile Falls.—*ib.*

HARVARD, a townſhip in the eaſtern part of Worceſter county, Maſſachuſetts, 23 miles N. E. of Worceſter, and 35 north-eaſterly of Boſton. It was incorporated in 1732, by this name, in honour of the founder of Harvard Univerſity in Cambridge. It has 1400 inhabitants.—*ib.*

HARWICH, a townſhip on Cape Cod, in Barnſtable county, Maſſachuſetts, lying between Yarmouth and Chatham, about 88 miles S. E. of Boſton, containing 2392 inhabitants. It extends quite acroſs the cape, which is here about 6 miles over. Their marine buſineſs lies chiefly in the fiſhery. The remains of the Indians of this townſhip are only 6 or 7 ſouls. They live at *Potanumaquut*—*ib.*

HARWICH, a townſhip in Rutland county, Vermont, containing 165 inhabitants.—*ib.*

HARWINGTON, a poſt-town of Connecticut, in Litchfield county, 8 miles E. of Litchfield, and 24 W. by N. of Hartford.—*ib.*

HASSELQUIST (Frederick) was born in the province of Eaſt Gothland in 1722, and ſtudied medicine and botany in the univerſity of Upſal. Linnæus had in his lectures repreſented the extraordinary merits and

Haſſelquiſt.

and great celebrity which a young ſtudent might obtain by travelling through Paleſtine, and by inquiring into and deſcribing the natural hiſtory of that country, which was till then unknown, and had become of the greateſt importance to interpret the bible, and to underſtand eaſtern philology. Haſſelquiſt was fired with ambition to accompliſh an object ſo important in itſelf, and ſo warmly recommended by his beloved maſter. There being no fund ariſing from the liberality of the crown, private collections were made, which poured in very copiouſly, eſpecially from the native country of the young traveller. All the faculties of the univerſity of Upſal alſo granted him a ſtipend.

Thus protected, he commenced his journey in the ſummer of 1749. By the interference of Lagerſtroem, he had a free paſſage to Smyrna in one of the Swediſh Eaſt Indiamen. He arrived there at the concluſion of the year, and was received in the moſt friendly manner by Mr A. Rydel, the Swediſh conſul. In the beginning of 1750 he ſet out for Egypt, and remained nine months at Cairo the capital. Hence he ſent to Linnæus, and to the learned ſocieties of his country, ſome ſpecimens of his reſearches. They were publiſhed in the public papers, and met with the greateſt approbation; and upon the propoſition of Dean Baeck and Dr Wargentin, ſecretary of the Royal Academy of Sciences, a collection of upwards of 10,000 dollars in copper money was made for the continuance of the travels of young Haſſelquiſt. Counſellors Lagerſtroem and Nordencrantz were the moſt active in raiſing ſubſcriptions at Stockholm and Gothenburgh. In the ſpring of 1751, he repaired to his deſtination, and paſſed through Jaffa to Jeruſalem, Jericho, &c. He returned afterwards through Rhodus and Scio to Smyrna. Thus he fulfilled all the expectations of his country, but he was not to reap the reward of his toils. The burning heat of the ſandy deſerts of Arabia had affected his lungs; he reached Smyrna in a ſtate of illneſs, in which he languiſhed for ſome time, and died February 9. 1752, in the 30th year of his age.

The fruits of his travels were, however, preſerved through the liberality of a great princeſs. He had been obliged to contract debts. The Turks, therefore, ſeized upon all his collections, and threatened to expoſe them to public ſale. The Swediſh conſul prevented it. He ſent, with the intelligence of the unhappy exit of his countryman, an account of the diſtreſſes under which he died;—and at the repreſentation of Dean Baeck, Queen Louiſa Ulrica granted the ſum of 14,000 dollars in copper ſpecie to redeem all his collections. They arrived afterwards in good preſervation at Stockholm; conſiſting of a great quantity of antiques, Arabian manuſcripts, ſhells, birds, ſerpents, inſects, &c. and were kept in the cabinets at Ulrichſdale and Drottningholm. The ſpecimens of the natural curioſities of theſe muſeums being double or treble in number, Linnæus obtained ſome of them, and publiſhed the voyage of his ill-fated friend, and honoured his memory with a plant, which he called from his name *Haſſelquiſtia*. HASSELQUISTA, *Encycl.*

Hat-making.

HAT-MAKING is a mechanical proceſs, which is detailed in the *Encyclopædia* from the beſt information that could then be obtained. We have lately learned, however, that our detail is ſometimes defective, and ſometimes erroneous; and it is our duty to ſupply thoſe defects, and to correct thoſe errors. But, ſtrangers as we are to the buſineſs of hat-making, we ſhould not perhaps have ſuſpected, that we had been miſled by the perſons whom we conſulted, had we not been informed by a very intelligent writer in Nicholſon's Philoſophical Journal, that the account of the manufacturing of hats, which is given in the *Encyclopædia* is far from the truth. This information induced us to look through the Journal itſelf for a more accurate account of the proceſs; well convinced, that the liberal-minded author of that work would not have pointed out our miſtakes without making us welcome to avail ourſelves of his aid to correct them. Our readers will therefore be indebted only to Mr Nicholſon and his correſpondent for whatever inſtruction they may derive from this article; and as we wiſh not to deck ourſelves in borrowed plumes, we ſhall communicate that inſtruction in the words of its author.

Having viſited the manufactory of Meſſrs Collinſons, hatters in Gravel-lane, Southwark, Mr Nicholſon gives the following account of their procedure:

“ The materials for making hats are rabbits fur cut off from the ſkin, after the hairs have been plucked out, together with wool and beaver. The two former are mixed in various proportions, and of different qualities, according to the value of the article intended to be made; and the latter our author believes to be univerſally uſed for facing the finer articles, and never for the body or main ſtuff. Experience has ſhewn, that theſe materials cannot be evenly, and well felted together, unleſs all the fibres be firſt ſeparated, or put into the ſame ſtate with regard to each other. This is the object of the firſt proceſs, called *bowing*. The material, without any previous preparation (A), is laid upon a platform of wood, or of wire, ſomewhat more than four feet ſquare, called a *hurdle*, which is fixed againſt the wall of the work-ſhop, and is enlightened by a ſmall window, and ſeparated by two ſide partitions from other hurdles, which occupy the reſt of the ſpace along the wall. The hurdle, if of wood, is made of deal planks, not quite three inches wide, diſpoſed parallel to the wall, and at the diſtance of one fortieth or one fiftieth of an inch from each other, for the purpoſe of ſuffering the duſt, and other impurities of the ſtuff, to paſs through; a purpoſe ſtill more effectually anſwered by the hurdle of wire.

“ The workman is provided with a bow, a bow-pin, a baſket, and ſeveral cloths. The bow is a pole of yellow deal wood, between ſeven and eight feet long, to which are fixed two bridges, ſomewhat like that which receives the hair in the bow of the violin (B). Over theſe

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(A) Some writers mention a partial wetting of the fur while on the ſkin, by lightly ſmearing it with a ſolution of nitrate of mercury to give it a curl. Meſſrs Collinſons do not uſe it, nor any other preparation.

(B) Mr Nicholſon's correſpondent, who is himſelf a hatter, ſays that a bow is beſt made of aſh; that it is compoſed of the *ſtang* or handle; that the bridge at the ſmaller end, or that which is neareſt the window in the act of bowing, is called the *cock*; and that the other bridge, which is nearer to the workman's hand, is called the *breech*.

theſe is ſtretched a catgut, about one-twelfth part of an inch in thickneſs. The bow-pin is a ſtick with a knob, and is uſed for plucking the bow-ſtring. The baſket is a ſquare piece of ozier work, conſiſting of open ſtrait bars with no croſſing or interweaving. Its length acroſs the bars may be about two feet, and its breadth eighteen inches. The ſides into which the bars are fixed are ſlightly bended into a circular curve, ſo that the baſket may be ſet upright on one of theſe edges near the right hand end of the hurdle, where it uſually ſtands. The cloths are linen. Beſides theſe implements, the workman is alſo provided with brown paper.

"The *bowing* commences by ſhovelling the material towards the right hand partition with the baſket, upon which, the workman holding the bow horizontally in his left hand, and the bow-pin in his right, lightly places the bow-ſtring, and gives it a pluck with the pin. The ſtring, in its return, ſtrikes part of the fur, and cauſes it to riſe, and fly partly acroſs the hurdle in a light open form. By repeated ſtrokes, the whole is thus ſubjected to the bow; and this beating is repeated till all the original clots or maſſes of the filaments are perfectly opened and obliterated. The quantity thus treated at once is called a *batt*, and never exceeds half the quantity required to make one hat.

"When the batt is ſufficiently bowed, it is ready for *hardening;* which term denotes the firſt commencement of felting. The prepared material being evenly diſpoſed on the hurdle, is firſt preſſed down by the convex ſide of the baſket, then covered with a cloth, and preſſed ſucceſſively in its various parts by the hands of the workman. The preſſure is gentle, and the hands are very ſlightly moved back and forwards at the ſame time through a ſpace of perhaps a quarter of an inch, to favour the hardening or entangling of the fibres (See Felting in this *Suppl.*) In a very ſhort time, indeed, the ſtuff acquires ſufficient firmneſs to bear careful handling. The cloth is then taken off, and a ſheet of paper, with its corners doubled in, ſo as to give it a triangular outline, is laid upon the batt, which laſt is folded over the paper as it lies, and its edges, meeting one over the other, form a conical cap. The joining is ſoon made good by preſſure with the hands on the cloth. Another batt, ready hardened, is in the next place laid on the hurdle, and the cap here mentioned placed upon it, with the joining downwards. This laſt batt being alſo folded up, will conſequently have its place of junction diametrically oppoſite to that of the inner felt, which it muſt therefore greatly tend to ſtrengthen. The principal part of the hat is thus put together, and now requires to be worked with the hands a conſiderable time upon the hurdle, the cloth being alſo occaſionally ſprinkled with clear water. During the whole of this operation, which is called *baſoning* (c), the article becomes firmer and firmer, and contracts in its dimenſions. It may eaſily be underſtood, that the chief uſe of the paper, is to prevent the ſides from felting together.

"The baſoning is followed by a ſtill more effectual continuation of the felting called *working* (d). This is done in another ſhop, at an apparatus called a *battery*, conſiſting of a *kettle* (containing water ſlightly acidulated with ſulphuric acid, to which, for beaver hats, a quantity of the grounds of beer is added, or elſe plain water for rinſing out), and eight *planks* of wood joined together in the form of a fruſtum of a pyramid, and meeting in the kettle at the middle. The outer or upper edge of each plank is about two feet broad, and riſes a little more than two feet and a half above the ground; and the ſlope towards the kettle is conſiderably rapid, ſo that the whole battery is little more than ſix feet in diameter. The quantity of ſulphuric acid added to the liquor is not ſufficient to give a ſour taſte, but only renders it rough to the tongue. In this liquor heated rather higher than unpractiſed hands could bear, the article is dipped from time to time, and then worked on the planks with a roller, and alſo by folding or rolling it up, and opening it again; in all which, a certain degree of care is at firſt neceſſary, to prevent the ſides from felting together; of which, in the more advanced ſtages of the operation, there is no danger. The imperfections of the work now preſent themſelves to the eye of the workman, who picks out knots and other hard ſubſtances with a bodkin, and adds more felt upon all ſuch parts as require ſtrengthening. This added felt is patted down with a wet bruſh, and ſoon incorporates with the reſt. The beaver is laid on towards the concluſion of this kind of working. Mr Nicholſon could not diſtinctly learn why the beer grounds were uſed with beaver-hats. Some workmen ſaid, that by rendering the liquor more tenacious, the hat was enabled to hold a greater quantity of it for a longer time; but others ſaid, that the mere acid and water would not adhere to the beaver facing, but would roll off immediately when the article was laid on the

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(c) Mr Nicholſon's correſpondent ſays, that after bowing, and previous to the baſoning, a *hardening ſkin*, that is, a large piece of ſkin, about four feet long and three feet broad, of leather alumed or half tanned, is preſſed upon the batt, to bring it by an eaſier gradation to a compact appearance; after which it is baſoned, being ſtill kept upon the hurdle. This operation, the baſoning, derives its name from the proceſs or *mode of working*, being the ſame as that practiſed upon a wool hat after bowing; the laſt being done upon a piece of caſt metal, four feet acroſs, of a circular ſhape, called *a baſon:* the joining of each batt is made good here by ſhuffling the hand, that is, by rubbing the edges of each batt folded over the other to excite the progreſſive motion of each of the filaments in felting, and to join the two together. Many journeymen, to hurry this work, uſe a quantity of vitriol (ſulphuric acid), and then, to make the nap riſe and flow, they kill the vitriol, and open the body again by throwing in a handful or two of oatmeal; by this means they get a great many made, though, at the ſame time, they leave them quite grainy from the want of labour. This, in handling the dry grey hat when made may be in part diſcovered; but in part only.

(d) The intelligent writer, who has been ſo often quoted, ſays, that before this operation is begun, the hat is dipped into the boiling kettle, and allowed to lie upon the plank until cold again; this is called *ſoaking*, that is, being perfectly ſaturated with the hot liquor: if they are put in too haſtily in this ſtate, for they are then only bowed and baſoned, they would burſt from the edges, each batt not being ſufficiently felted into the other.

plank. It is probable, as he obſerves, that the manufacturers who now follow the eſtabliſhed practice, may not have tried what are the inconveniencies this addition is calculated to remove."

Our author's correſpondent, however, aſſigns ſeveral reaſons for the addition of thoſe dregs, which, he ſays, ought to be thick, and the ſoureſt that can be got. 1. Vitriol (ſulphuric acid) would harden the hat too much, which is kept mellow by the dregs. 2. The dregs are ſaid by the workmen to hold or fill the body, whilſt a little vitriol cleanſes it of the dirt, &c. that may be on the rabbit or other wools. 3. Another advantage attending the uſe of dregs, whether of beer, porter, or wine, is, that as the boiling of the dyeing does not draw out much of the mucilage from each hat when it comes to be ſtiffened, the dregs form a body within the hat, ſufficiently ſtrong or retentive to keep the glue from coming through amongſt the nap. 4. Vitriol (ſulphuric acid) alone purges or weakens the goods too much; conſequently half of the quantity does better with the addition of dregs, as it allows the body to be made cloſer by more work.

Of theſe four reaſons for the uſe of dregs, the laſt alone appears to us perſpicuous or at all ſatisfactory. But be this as it may, acid of ſome kind gives a roughneſs to the ſurface of the hair, which facilitates the mechanical action of felting; and Mr Collinſon informed Mr Nicholſon, that in a proceſs, called *carotting*, they make uſe of nitrous acid. In this operation, the material is put into a mixture of the nitrous and ſulphuric acids in water, and kept in the digeſting heat of a ſtove all night; by which means the hair acquires a ruddy or yellow colour, and loſes part of its ſtrength.

"It muſt be remembered, that our hat ſtill poſſeſſes the form of a cone, and that the whole of the ſeveral actions it has undergone have only converted it into a ſoft flexible felt, capable of being extended, though with ſome difficulty, in every direction. The next thing to be done is to give it the form required by the wearer. For this purpoſe the workman turns up the edge or rim to the depth of about an inch and a half, and then returns the point back again through the centre or axis of the cap, ſo far as not to take out this fold, but to produce another inner fold of the ſame depth. The point being returned back again in the ſame manner, produces a third fold; and thus the workman proceeds, until the whole has acquired the appearance of a flat circular piece, conſiſting of a number of concentric undulations or folds, with the point in the centre. This is laid upon the plank, where the workman, keeping the piece wet with the liquor, pulls out the point with his fingers, and preſſes it down with his hand, at the ſame time turning it round on its centre in contact with the plank, till he has, by this means, rubbed out a flat portion, equal to the intended crown of the hat. In the next place he takes a block, to the crown of which he applies the flat central portion of the felt, and by forcing a ſtring down the ſides of the block, he cauſes the next part to aſſume the figure of the crown, which he continues to wet and work, until it has properly diſpoſed itſelf round the block. The rim now appears like a flounced or puckered appendage round the edge of the crown; but the block being ſet upright on the plank, the requiſite figure is ſoon given by working, rubbing and extending this part. Water only is uſed in this operation of faſhioning or blocking; at the concluſion of which it is preſſed out by the blunt edge of a copper implement for that purpoſe.

"Previous to the dyeing, the nap of the hat is raiſed or looſened out with a wire bruſh, or carding inſtrument. The fibres are too rotten after the dyeing to bear this operation. The dyeing materials are logwood, and a mixture of the ſulphates of iron and of copper, known in the market by the names of green copperas and blue vitriol. As the time of Mr Collinſon was limited, and my attention, ſays Mr Nicholſon, was more particularly directed to the mechanical proceſſes, I did not go into the dye-houſe; but I have no doubt that the hats are boiled with the logwood, and afterwards immerſed in the ſaline ſolution. I particularly aſked whether galls were uſed, and was anſwered in the negative.

"The dyed hats are, in the next place, taken to the ſtiffening ſhop. One workman, aſſiſted by a boy, does this part of the buſineſs. He has two veſſels, or boilers, the one containing the grounds of ſtrong beer, which coſts ſeven ſhillings per barrel, and the other veſſel containing melted glue a little thinner than it is uſed by carpenters. Our author particularly aſked, whether this laſt ſolution contained any other ingredient beſides glue, and was aſſured that it did not. The beer grounds are applied in the inſide of the crown to prevent the glue from coming through to the face, and alſo, as he ſuppoſes, to give the requiſite firmneſs at a leſs expence than could be produced by glue alone. If the glue were to paſs through the hat in different places, it might, he imagines, be more difficult to produce an even gloſs upon the face in the ſubſequent finiſhing. The glue ſtiffening is applied after the beer-grounds are dried, and then only upon the lower face of the flap, and the inſide of the crown. For this purpoſe, the hat is put into another hat, called a ſtiffening hat, the crown of which is notched, or ſlit open in various directions. Theſe are then placed in a hole in a deal board, which ſupports the flap, and the glue is applied with a bruſh.

"The dry hat, after this operation, is very rigid, and its figure irregular. The laſt dreſſing is given by the application of moiſture and heat, and the uſe of the bruſh, and a hot iron, ſomewhat in the ſhape of that uſed by tailors, but ſhorter and broader on the face. The hat being ſoftened by expoſure to ſteam, is drawn upon a block, to which it is ſecurely applied by the former method of forcing a ſtring down from the crown to the commencement of the rim. The judgment of the workman is employed in moiſtening, bruſhing, and ironing the hat, in order to give and preſerve the proper figure. When the rim of the hat is not intended to be of an equal width throughout, it is cut by means of a wooden, or perhaps metallic pattern; but as no ſuch hats are now in faſhion, Mr Nicholſon ſaw only the tool for cutting them round. The contrivance is very ingenious and ſimple. A number of notches are made in one edge of a flat piece of wood for the purpoſe of inſerting the point of a knife, and from one ſide or edge of this piece of wood there proceeds a ſtrait handle, which lies parallel to the notched ſide, forming an angle ſomewhat like that of a carpenter's ſquare. When the legs of this angle are applied to the outſide of the crown, and the board lies flat on the rim of the hat, the notched edge will lie nearly in the direction of the radius, or line pointing to the centre of the hat. A knife being therefore inſerted in one of the notches, it is eaſy to draw it round by leaning the tool againſt the crown, and it will cut the border very regular and true. This cut is made before the hat is quite finiſhed, and is not carried entirely through; ſo that one of the laſt operations conſiſts in tearing off the redundant part, which by that means leaves an edging of beaver round the external face of the flap. When the hat is completely finiſhed, the crown is tied up in gauze paper, which is neatly ironed down. It is then ready for the ſubſequent operations of lining," &c.

Our author concludes his valuable memoir on the fabrication of hats, with ſome obſervations on the probable gain or loſs of employing machinery in the manufacture. Theſe obſervations, as they are ſtated in the original paper, we recommend to the ſerious attention of every judicious hat-maker, who carries on his buſineſs on a large ſcale; for he will find them not the reveries of a raſh ſpeculatiſt, but the cool reflections of a real philoſopher, who is at the ſame time no ſtranger to the arts of life. They ſuggeſt the following ſubjects of enquiry; Whether carding, which is rapidly and mechanically done, be inferior to bowing, which does not promiſe much facility for mechanical operation? Whether a ſucceſſion of batts or cardings might be thrown round a fluted cone, which rapidly revolving, in contact with three or more cylinders, might perform the hardening, and even the working, with much more preciſion and ſpeed than they are now done by hand? Whether blocking or ſhaping be not an operation extremely well calculated for the operation of one or more machines? Whether looſe weaving and ſubſequent felting might not produce a lighter, cheaper, and ſtronger article? And how far the mechanical felting, which is not confined merely to the hairs of animals, might be applied to this art?

Before we diſmiſs this ſubject, it may be worth while to ſtate Mr Dunnage's method of making *water-proof hats*, in imitation of beaver, for which, in November 1794, he obtained a patent. It is as follows: Let a ſhag be woven, of ſuch count in the reed, and cut over ſuch ſized wire, as will give the hats to be manufactured from it that degree of richneſs, or appearance of fur, which may be thought neceſſary. The materials of which this ſhag may be compoſed are various, and ſhould be accommodated to different kinds of hats, according to the degree of beauty and durability to be given them, and the price at which they are deſigned to be ſold; that is to ſay, ſilk, mohair, or any other hair that is capable of being ſpun into an end fine enough for the purpoſe, cotton, inkle, wool, or a mixture of any, or all the above materials, as may ſuit the different purpoſes of the manufacturer. Thoſe anſwer beſt, (ſays our author), which are made with two poles, either of Bergam, Piedmont, or Organzine ſilk, riſing alternately, in a reed of about nine hundred count to eighteen inches wide, with three ſhoots over each wire. This method of weaving diſtributes the ſilk (as it may be put ſingle into the harneſs), and prevents any ribby appearance which it might have if the ſilk were paſſed double, and the whole of the pole cut over each wire. This may be made either on a two or four thread ground of hard ſilk, ſhot with fine cotton, which he thinks preferable for ſhoot, to ſilk, inkle, or any other material, as it forms both a cloſe and fine texture. An inferior kind of hats may be made from any of the before mentioned materials, and with cheaper ſilk. This ſhag ſhould be ſtretched on a frame, ſuch as dyers uſe to rack cloth; then (having previouſly ſet the pile upright with a comb, to prevent its being injured or ſtuck together), go over the ground with thin ſize, laid on with a ſoft bruſh. For black, or dark colours, common ſize will do; with white, or any light colour, uſe iſinglaſs, or a ſize made from white kid leather. Theſe, or gum, or any other mucilaginous matter, which, without altering the colour, will prevent oil from getting through the ground ſo as to injure the pile, will anſwer the purpoſe. Take care not to apply more of any material, as a preparation, than may be fully ſaturated with oil or varniſh, ſo that water will not diſcharge it from the ground. The ſize, or other glutinous matter, being dry, the pile muſt be teaſeled, or carded with a fine card, till the ſilk is completely taken out of the twiſt or throwing, when it will loſe its coarſe ſhaggy look, and aſſume the appearance of a very fine fur. It muſt now be once more ſet upright with a comb, and you may proceed to lay on your water-proof material; this too may be varied according to circumſtances. For black, or any dark colour, linſeed oil well boiled with the uſual driers, and thickened with a ſmall quantity of any good drying colour, will do; for white, or very fine colours, poppy or nut oil, or copal or other varniſhes, may be uſed. In this particular the manufacturer muſt judge what will beſt anſwer his purpoſe, taking care never to uſe any thing that will dry hard, or be ſubject to crack. Mr Dunnage has found good drying linſeed oil preferable to any other thing which he has uſed, and, with the precaution of laying on very little the firſt time, it will not injure the fineſt colours. When the firſt coat of oil is dry, go over it a ſecond and a third time, if neceſſary, till you are convinced the pores of the ground are fully cloſed up, and the ſtuff rendered impervious to water. It ſhould now ſtand ſeveral days, till the ſmell is ſufficiently gone off; and before it is taken from the frame, ſhould be gone over with ſome ox gall or lime-water, to take off the greaſineſs, which would otherwiſe prevent the ſtiffening from adhering to the oil. The material being now ready to be formed into hats, ſhould be cut into proper ſhapes for that purpoſe. The crown ſhould be made up over a block, with needle and ſilk, the oiled ſide outwards. The ſeams ſhould then be rubbed with a piece of hard wood, bone, or ivory, to make them lie flat, and the edges of the ſtuff pared off very near the ſtitches, that no joint may appear on the right ſide. The ſeams ſhould then be carefully gone over with the prepared oil, till every crevice or hole made by the needle is completely filled up, and the crown rendered perfectly water-proof. The crown may then be turned and ſtiffened, by ſticking linen, leather, paper, or any other material that may be found to anſwer the purpoſe, to the inner or painted ſide, till it acquires about the ſame degree of ſtiffneſs, or reſiſtance to the touch, as a good beaver. The mucilaginous matter which he uſed to attach the ſtiffening to the crown, and the upper and under parts of the brim to each other, was compoſed of one pound of gum-arabic or ſenega, one pound of ſtarch, and a half a pound of glue, boiled up with as much water as reduced the whole to the conſiſtence of a thick paſte. A greater or leſs proportion of any of theſe ingredients may be uſed, and other glutinous and adheſive ſubſtances may anſwer the ſame purpoſes; or drying-oils may be made uſe of, inſtead of this or other mucilage; or any of the reſinous gums diſſolved in oil or ſpirits; only it ſhould be obſerved, in this caſe, the hats will require more time in the preparation, as the oily matter, unleſs expoſed to the air, will not readily dry; but he found by experience that the above mentioned compoſition does not dry hard or brittle, but retains that pleaſant flexibility which is agreeable to the touch, while it communicates to the other materials a ſufficient degree of elaſticity. Before the brim is perfectly dry, care ſhould be taken to form a neck or riſing round the hole where it is to be attached to the crown, by notching it round with a pair of ſciſſars, and then forcing it over a block ſomething larger than you have made the hole, ſo that the uncut ſtuff may turn up, under the lower edge of the crown, about a quarter of an inch. Before you join the crown and brim together, go over the outſide of the neck of the brim, and the inſide of the crown, as high as the neck will come (which ſhould be about half an inch), with the prepared oil; and when they are nearly dry, ſo as to adhere to the finger on touching them, put the crown over the neck of the brim, and let them be ſewed ſtrongly together, taking care to ſew down as little of the pile as poſſible, and uſing the ſame precaution of oiling, where the needle has been through, as was obſerved in making up the crown. The hat is now ready for dreſſing; which operation may be performed over a block, with a hot iron, bruſh, &c. in the ſame manner as thoſe commonly called felts. When putting in the lining, be very careful to let the needle only take hold of the under ſurface of the brim; for ſhould it perforate the upper one, the water will find its way through, and the hat be of no value. Though we have already declared how little we are acquainted with the operation of hat-making, we cannot help ſuggeſting the enquiry, whether theſe water-proof hats might not be improved both in ſtrength and beauty, by a ſlight felting before the application of the ſize by the bruſh. Such of them as are compoſed of wool or hair, or contain a mixture of theſe materials, are unqueſtionably ſuſceptible of felting.

HATBOROUGH, a ſmall town in Montgomery county, Pennſylvania, ſituated on the N. E. ſide of Pennepeck Creek, which runs into Delaware river about 5 miles above Frankfort. It contains about 20 houſes.—*Morſe.*

HATCHY, a navigable river in the State of Tenneſſee, runs weſterly into the Miſſiſſippi, about 19 miles N. of Wolf river, and is about 80 yards wide 7 miles from its mouth.—*ib.*

HATFIELD, a very pleaſant town in Hampſhire county, Maſſachuſetts, ſituated on the weſt bank of a bend of Connecticut river where it is 80 rods wide, 5 miles north of Northampton, and 100 weſt of Boſton. It lies chiefly on one ſtreet, and contains 103 houſes, and 703 inhabitants. Here are two ferries on Connecticut river; the one to Hadley, the other to Amherſt. North of the ferry to Amherſt, the river meets with a bed of rocks, which leſſens its breadth 20 or 30 rods—no fall, but a large eddy at high water.—*ib.*

HATTERAS is the moſt remarkable and dangerous cape on the coaſt of N. America. This point extends far into the ocean, from the coaſt of N. Carolina, in 35° 15′ N. lat. The water is very ſhoal at a great diſtance from the cape, which is remarkable for ſudden ſqualls of wind, and for the moſt ſevere ſtorms of thunder, lightning and rain, which happen almoſt every day, during one half the year. At the time of Sir Walter Raleigh's approaching this coaſt, the ſhoals in the vicinity of Hatteras were found ſo dangerous, ſo extenſive, and ſo ſhallow, many of them covered with not more than 5 or 6 feet water, that no veſſels, in that latitude, ventured within 7 leagues of the land.

At preſent the out-ſhoals, which lie about 14 miles S. W. of the cape, are but of 5 or 6 acres extent, and where they are really dangerous to veſſels of moderate draught, not above half that extent. On the ſhoaleſt part of theſe is about 10 feet at low water; and here, at times, the ocean breaks in a tremendous manner, ſpouting, as it were, to the clouds, from the violent agitation of the Gulf Stream, which touches the eaſtern edge of the banks, from which the declivity is ſudden, that is to ſay, from 10 fathoms to no ſoundings. On the ſpot above mentioned, which is firm ſand, it has been the lot of many a good veſſel to ſtrike, in a gale of wind, and go to pieces. In moderate weather, however, theſe ſhoals may be paſſed over, if neceſſary, at full tide, without much danger, by veſſels not drawing more than 8, 9, or 10 feet water. From this bank, formerly of vaſt extent, and called the *Full Moon Shoal*, a ridge runs the whole diſtance to the cape about a N. W. courſe, is about half a mile wide, and at low water has generally, 10, 11 and 12 feet water. There are gaps at equal intervals, affording channels of about 15 or 16 feet water. The moſt noted of theſe is about a mile and a half from the land, and is at leaſt two miles and a half wide, and might at full ſea be ſafely paſſed by the largeſt ſhips; but is rarely uſed except by coaſting veſſels. It may be eaſily known by a range of breakers always ſeen on the weſt ſide, and a breaker head or two on the eaſtern ſide; which, however, are not ſo cônſtant, only appearing when the ſea is conſiderably agitated. A little north of the cape is good anchoring in 4 or 5 fathoms; and with the wind to the weſtward, a boat may land in ſafety, and even bring off caſks of freſh water, plenty of which is to be found every where on the beach, by digging a foot or two, and putting a barrel into the ſand.—*ib.*

HATTON'S FORD, on Tugelo river, a village 16 miles from Pendleton court-houſe, in S. Carolina, and 17 from Franklin court-houſe, in Georgia.—*ib.*

HAVERFORD, a townſhip in Delaware county, Pennſylvania.—*ib.*

HAVERHILL, a poſt-town of New-Hampſhire, and the capital of Grafton county, ſituated on the eaſt ſide of Connecticut river, in Lower Coos. It has between 40 and 50 compact houſes, a well conſtructed court-houſe, and a congregational church. This townſhip was incorporated in 1763, and contains 552 inhabitants. In it is a bed of iron ore, which has yielded ſome profit to the proprietor, alſo a quarry of freeſtone, fit for hearths and chimney pieces. It has alſo a fulling-mill, an oil-mill, and many other excellent mill ſeats. It is oppoſite to Newbury in Vermont, 35 miles above Dartmouth college, 119 miles N. W. of Portſmouth.—*ib.*

Haverhill, a handſome poſt-town of Maſſachuſetts, in Eſſex county, ſituated on the N. ſide of Merrimack river, acroſs which is an elegant bridge, connecting this town with Bradford, 650 feet long and 34 wide. It has 3 arches, of 180 feet each, ſupported by 3 handſome ſtone piers, 40 feet ſquare; alſo a draw of 30 feet, over the channel of the river. Haverhill has a conſiderable inland trade, lying about 32 miles N. by W. of Boſton, and 12 miles from Newburyport, at the mouth of the river, and about 28 S. W. of Portſmouth in New-Hampſhire. It lies chiefly upon two ſtreets; the principal of which runs parallel with the river. Veſſels of 100 tons burden can go up to it. Travellers are ſtruck with the pleaſantneſs of the ſituation; and a number of neat and well finiſhed houſes give it an air of elegance. Here are two churches, one for Congregationaliſts and one for Baptiſts; 3 diſtilleries, one of which has lately undergone a laudable tranſmutation into a brewery. Some veſſels are annually built here, and ſeveral are employed in the Weſt-India trade. A manufactory of ſail-cloth was begun here in 1789, and is ſaid to be in a promiſing way. The trade of the place, however, is conſiderably leſs than before the revolution. The whole townſhip contains 330 houſes, and 2,408 inhabitants.—*ib.*

HAVERSTRAW BAY, called by ſome *Haverſham*, in Hudſon's river, 38 miles above New-York city, ſpreads S. of Stony Point, and before the town of its own name, is 10 miles long and about 3 wide.—*ib.*

Haverstraw, a townſhip in Orange county, New-York, ſituated on the W. ſide of the above bay, 35 miles N. of New-York city. It contains 4,826 inhabitants, of whom 98 are qualified electors, and 238 ſlaves.—*ib.*

HAVRE DE GRACE, or GRAS, a poſt town and port of entry in Harford county, Maryland, on the W. ſide of Suſquehannah river, at its mouth in Cheſapeak Bay. It contains about 40 houſes, 250 inhabitants, and is the port of entry for all the ſhores of Cheſapeak Bay above Turkey Point. It is 6 miles W. by S. of Charleſton in Cecil county, 37 N. E. of Baltimore, and 65 W. S. W. of Philadelphia. N. lat. 39° 39′.—*ib.*

HAW, a water of Cape Fear which unites with Deep river. It may be rendered navigable for 50 miles.—*ib.*

HAWKE, a townſhip in Rockingham county, New-Hampſhire, was incorporated in 1760, and contained in 1775, 504, and in 1790, 420 inhabitants.—*ib.*

HAWKINS (Sir John), was the youngeſt ſon of a man who, though deſcended from Sir John Hawkins the memorable admiral and treaſurer of the navy in the reign of Queen Elizabeth, followed at firſt the occupation of a houſe-carpenter, which he afterwards exchanged for the profeſſion of a ſurveyor and builder. He was born in the city of London on the 30th day of March 1719; and after having been ſent firſt to one ſchool, and afterwards to a ſecond, where he acquired a tolerable knowledge of Latin, he went through a regular courſe of architecture and perſpective, in order to fit him for his father's profeſſion of a ſurveyor. He was, however, perſuaded, by a near relation, to abandon the profeſſion of his firſt choice, and to embrace that of the law; and was accordingly articled to Mr John Scott an attorney and ſolicitor in great practice. In this ſituation his time was too fully employed in the actual diſpatch of buſineſs to permit him, without ſome extraordinary means, to acquire the neceſſary knowledge of his profeſſion by reading and ſtudy; beſides that, his maſter is ſaid to have been more anxious to render him a good copying clerk, by ſcrupulous attention to his hand-writing, than to qualify him by inſtruction to conduct buſineſs. To remedy this inconvenience, therefore, he abridged himſelf of his reſt, and riſing at four in the morning, found opportunity of reading all the neceſſary and moſt eminent law writers, and the works of our moſt celebrated authors on the ſubjects of verſe and proſe. By theſe means, before the expiration of his clerkſhip, he had rendered himſelf a very able lawyer, and had acquired a love for literature in general, but particularly for poetry and the polite arts; and the better to facilitate his improvement, he occaſionally furniſhed to the Univerſal Spectator, the Weſtminſter Journal, the Gentleman's Magazine, and other periodical publications of the time, eſſays and diſquiſitions on ſeveral ſubjects. The firſt of theſe is believed to have been an Eſſay on *Swearing;* but the exact time of its appearance, and the paper in which it was inſerted, are both unknown. It was, however, re-publiſhed ſome years before his death (without his knowledge till he ſaw it in print) in one of the newſpapers. His next production was an Eſſay on *Honeſty*, inſerted in the Gentleman's Magazine for March 1739; and which occaſioned a controverſy, continued through the Magazines for ſeveral ſucceeding months, between him and a Mr Calamy, a deſcendant of the celebrated Dr Edmund Calamy, then a fellow-clerk with him.

About the year 1741, a club having been inſtituted by ſeveral amateurs of muſic, under the name of the Madrigal Society, to meet every Wedneſday evening, and his clerkſhip being now out, he became a member of it, and continued ſo many years. Purſuing his inclination for muſic ſtill farther, he became alſo a member of the Academy of Ancient Muſic, which uſed to meet every Thurſday evening at the Crown and Anchor in the Strand, but ſince removed to Freemaſons Hall; and of this he continued a member till a few years before its removal.

Impelled by his own taſte for poetry, and excited to it by his friend Foſter Webb's example, who had contributed to the Gentleman's Magazine many very elegant poetical compoſitions, he had, before this time, himſelf become an occaſional contributor in the ſame kind, as well to that as to ſome other publications. The earlieſt of his productions of this ſpecies, now known, is ſuppoſed to be a copy of verſes "To Mr George Stanley, occaſioned by looking over ſome Compoſitions of his lately publiſhed," which bears date 19th February 1740, and was inſerted in the Daily Advertiſer for February 21. 1741; but, about the year 1742, he propoſed to Mr Stanley, the project of publiſhing, in conjunction with him, ſix cantatas for a voice and inſtruments, the words to be furniſhed by himſelf, and the muſic by Mr Stanley. The propoſal was accepted, the publication was to be at their joint expence, and for their mutual benefit; and accordingly, in 1742, ſix cantatas were thus publiſhed, the five firſt written by Mr Hawkins, the ſixth and laſt by Foſter Webb; and theſe having ſucceeded beyond the moſt ſanguine expectations of their authors, a ſecond ſet of ſix more, written wholly by himſelf, was in like manner publiſhed a few months after, and ſucceeded equally well.

As theſe compoſitions, by being frequently performed at Vauxhall, Ranelagh, and other public places, and at many private concerts, had become favourite entertainments, many perſons, finding the author alſo a modeſt well-informed young man of unexceptionable morals, were become deſirous of his acquaintance. Among theſe was Mr Hare of Limehouſe, a brewer, who being himſelf a muſical man, and having met him at Mr Stanley's at muſical parties, gave him an invitation to his houſe: and, to forward him in his profeſſion, introduced him to a friend of his, Peter Storer of Highgate, Eſq; which proved the means of making his fortune.

In the winter of the year 1749, Dr then Mr Johnſon, was induced to inſtitute a club to meet every Tueſday evening at the King's Head, in Ivy-lane, near St Paul's. It conſiſted only of nine perſons; and Mr Hawkins was one of the firſt members. About this time, as it is ſuppoſed, finding his father's houſe, where he had hitherto reſided, too ſmall for the diſpatch of his buſineſs, now very much increaſing, he, in conjunction with Dr Muncley, a phyſician, with whom he had contracted an intimacy, took a houſe in Clements-lane, Lombard-ſtreet. The ground floor was occupied by him as an office, and the firſt floor by the Doctor as his apartment. Here he continued till the beginning of 1753, when, on occaſion of his marriage with Sidney, the youngeſt of Mr Storer's daughters, who brought him a conſiderable fortune, he took a houſe in Auſtin Friars, near Broad-ſtreet, ſtill continuing to follow his profeſſion of an attorney.

Having received, on the death of Peter Storer, Eſq; his wife's brother, in 1759, a very large addition to her fortune, he quitted buſineſs to Mr Clark, afterwards Alderman Clark, who had a ſhort time before completed his clerkſhip under him, diſpoſed of his houſe in Auſtin Friars, and purchaſed a houſe at Twickenham. Soon afterwards he bought the leaſe of one in Hatton-ſtreet London, for a town reſidence.

From a very early period of his life he had entertained a ſtrong love for the amuſement of angling; and his affection for it, together with the vicinity of the river Thames, was undoubtedly his motive to a reſidence at this village. He had been long acquainted with Walton's Complete Angler; and had, by obſervation and experience, become himſelf a very able proficient in the art. Hearing, about this time, that Mr Moſes Browne propoſed to publiſh a new edition of that work, and being himſelf in poſſeſſion of ſome material particulars reſpecting Walton, he, by letter, made Mr Browne an offer of writing, for his intended edition, Walton's Life. To this propoſal no anſwer was returned, at leaſt for ſome time; from which circumſtance Mr Hawkins concluded, as any one reaſonably would, that his offer was not accepted; and, therefore, having alſo learnt that Mr Browne meant not to publiſh the text as the author left it, but to modernize it, in order to file off the ruſt, as he called it, he wrote again to tell Mr Browne that he underſtood his intention was to ſophiſticate the text, and that therefore he, Mr Hawkins, would himſelf publiſh a correct edition. Such an edition, in 1760, he accordingly publiſhed in octavo with notes, adding to it a Life of Walton by himſelf, a Life of Cotton, the author of the ſecond part by the well-known Mr Oldys; and a ſet of cuts deſigned by Wale, and engraved by Ryland.

His propenſity to muſic, manifeſted by his becoming a member and frequenter of the ſeveral muſical ſocieties before mentioned, and alſo by a regular concert at his houſe in Auſtin Friars, had led him, at the time that he was endeavouring to get together a good library of books, to be particularly ſolicitous for collecting the works of ſome of the beſt muſical compoſers; and, among other acquiſitions, it was his ſingular good fortune to become poſſeſſed by purchaſe of ſeveral of the moſt ſcarce and valuable theoretical treatiſes on the ſcience any where extant, which had formerly been collected by Dr Pepuſch. With this ſtock of erudition, therefore, he, about this time, at the inſtance of ſome friends, ſet about procuring materials for a work then very much wanted, a Hiſtory of the Science and Practice of Muſic, which he afterwards publiſhed.

At the recommendation of the well known Paul Whitehead, to the Duke of Newcaſtle, then Lord Lieutenant for Middleſex, his name was, in 1761, inſerted in the Commiſſion of the Peace for that county; and having by the proper ſtudies, and a ſedulous attendance at the ſeſſions, qualified himſelf for the office, he became an active and uſeful magiſtrate in the county (A). Obſerving, as he had frequent occaſion to do in the courſe of his duty, the bad ſtate of highways, and the great defect in the laws for amending and keeping them in repair, he ſet himſelf to reviſe the former ſtatutes, and drew an act of parliament conſolidating all the former ones, and adding ſuch other regulations as were neceſſary. His ſentiments on this ſubject he publiſhed in octavo, in 1763, under the title of "Obſervations on the State of Highways, and on the Laws for amending and keeping them in repair;" ſubjoining to them the draught of the act before mentioned; which bill being afterwards introduced into parliament, paſſed into a law, and is that under which all the highways in England are at this time kept repaired. Of this bill it is but juſtice to add, that, in the experience of more than thirty years, it has never required a ſingle amendment.

Johnſon and Sir Joſhua, then Mr Reynolds, had, in the winter of this year 1763, projected the eſtabliſhment of a club to meet every Monday evening at the Turk's Head in Gerard ſtreet; and, at Johnſon's ſolicitation, Mr Hawkins became one of the firſt members.

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(A) When he firſt began to act, he formed a reſolution of taking no fees, not even the legal and authoriſed ones, and purſued this method for ſome time, till he found that it was a temptation to litigation, and that every trifling ale-houſe quarrel produced an application for a warrant. To check this, therefore, he altered his mode, and received his due fees, but kept them ſeparately in a purſe; and at the end of every ſummer, before he left the country for the winter, delivered the whole amount to the clergyman of the pariſh, to be by him diſtributed among ſuch of the poor as he judged fit.

An event of conſiderable importance engaged him, in the year 1764, to ſtand forth as the champion of the county of Middleſex, againſt a claim then for the firſt time ſet up, and ſo enormous in its amount as juſtly to excite reſiſtance. The city of London finding it neceſſary to re-build the gaol of Newgate, the expence of which, according to their own eſtimates, would amount to L.40,000, had this year applied to parliament, by a bill brought into the Houſe of Commons, in which, on a ſuggeſtion that the county priſoners removed to Newgate for a few days previous to their trials at the Old Bailey, were as two to one of the London priſoners, conſtantly confined there, they endeavoured to throw the burthen of two-thirds of the expence on the county, while they themſelves propoſed to contribute one-third only. This attempt the magiſtrates for Middleſex thought it their duty to oppoſe; and accordingly a vigorous oppoſition to it was commenced and ſupported under the conduct of Mr Hawkins, who drew a petition againſt the bill, and a caſe of the county, which was printed and diſtributed amongſt the members of both houſes of parliament. It was the ſubject of a day's converſation in the Houſe of Lords; and it produced ſuch an effect in the Houſe of Commons, that the city, by its own members, moved for leave to withdraw the bill. The ſucceſs of this oppoſition, and the abilities and ſpirit with which it was conducted, naturally attracted towards Mr Hawkins the attention of his fellow-magiſtrates; and the chairman of the quarter ſeſſions dying not long after, he was, on the 19th day of September 1765, elected his ſucceſſor.

In the year 1771, he quitted Twickenham, and ſold his houſe there to Mr Vaillant; and, in the ſummer of the next year, for the purpoſe of obtaining, by ſearches in the Bodleian and other libraries, farther materials for his hiſtory of muſic, he made a journey to Oxford, carrying with him an engraver from London, to make drawings from the portraits in the muſic ſchool.

On occaſion of actual tumults or expected diſturbances, he had more than once been called into ſervice of great perſonal danger. When the riots at Brentford had ariſen, during the time of the Middleſex election in the year 1768, he and ſome of his brethren attended to ſuppreſs them; and, in conſequence of an expected riotous aſſembly of the journeymen Spital-fields weavers in Moorfields in 1769, the magiſtrates of Middleſex, and he at their head, with a party of guards, attended to oppoſe them; but the mob, on ſeeing them prepared, thought it prudent to diſperſe. In theſe and other inſtances, and particularly in his conduct as chairman, having given ſufficient proof of his activity, reſolution, abilities, integrity and loyalty, he, on the 23d of October 1772, received from his majeſty the honour of knighthood.

In 1773 Dr Johnſon and Mr Stevens publiſhed, in ten volumes octavo, their firſt joint edition of Shakeſpeare, to which Sir John Hawkins contributed ſuch notes as are diſtinguiſhed by his name, as he afterwards did a few more on the republication of it in 1778. An addreſs to the king from the county of Middleſex, on occaſion of the American war, having, in 1774, been judged expedient, and at his inſtance voted, he drew up ſuch an addreſs, and, together with two of his brethren, had, in the month of October in that year, the honour of preſenting it.

After ſixteen years labour, he, in 1776, publiſhed, in five volumes quarto, his General Hiſtory of the Science and Practice of Muſic; which in conſequence of permiſſion obtained in 1773, he dedicated to the king, and preſented it to him at Buckingham-houſe on the 14th of November, 1776, when he was honoured with an audience of conſiderable length both from the king and queen.

Not long after this publication, that is to ſay in November 1777, he was induced, by an attempt to rob his houſe, which, though unſucceſsful, was made three different nights with the interval of one or two only between each attempt, to quit his houſe in Hatton-ſtreet; and, after a temporary reſidence for a ſhort time in St James's Place, he took a leaſe of one, formerly inhabited by the famous admiral Vernon, in the ſtreet leading up to Queen Square, Weſtminſter, and removed thither.

By this removal he became a conſtant attendant on Divine worſhip at the pariſh-church of St Margaret, Weſtminſter; and having learnt, in December 1778, that the ſurveyor to the board of ordnance was, in defiance of a proviſo in the leaſe under which they claimed, carrying up a building at the eaſt end of the church, which was likely to obſcure the beautiful painted glaſs window over the altar there, Sir John Hawkins, with the concurrence of ſome of the principal inhabitants, wrote to the ſurveyor, and compelled him to take down two feet of the wall, which he had already carried up above the ſill of the window, and to ſlope off the roof of his building in ſuch a manner as that it is not only no injury, but, on the contrary, a defence to the window.

In the month of December 1783, Dr Johnſon having diſcovered in himſelf ſymptoms of a dropſy, ſent for Sir John Hawkins, and telling him the precarious ſtate of his health, declared his deſire of making a will, and requeſted him to be one of his executors. Sir John accepted the office; inſtructed the Doctor how to make his will: and on his death undertook to be his biographer, and the guardian of his fame, by publiſhing a complete edition of his works.

Not three months after the commencement of this undertaking, he met with the ſevereſt loſs of almoſt any that a literary man can ſuſtain, ſhort of that of his friends or relations, in the deſtruction, by fire, of his library; conſiſting of a numerous and well-choſen collection of books, ancient and modern, in many languages, and on moſt ſubjects, which it had been the buſineſs of above 30 years at intervals to get together. Of this loſs, great as it was in pecuniary value, and compriſing in books, prints, and drawings, many articles that could never be replaced, he was never heard in the ſmalleſt degree to complain; but having found a temporary reception in a large houſe in Orchard-ſtreet, Weſtminſter, he continued there a ſhort time, and then took a houſe in the Broad Sanctuary, Weſtminſter.

This event, for a ſhort time, put a ſtop to the progreſs of his literary purſuits. As ſoon, however, as he could ſufficiently collect his thoughts, he recommenced his office of biographer of Johnſon; and completed his intention by publiſhing, in 1787, the life and works, in eleven volumes octavo, which he dedicated to the king.

With this production he terminated his literary labours; and having for many years been more particularly ſedulous in his attention to the duties of religion, and accuſtomed to ſpend all his leiſure from other neceſſary concerns in theological and devotional ſtudies, he now more cloſely addicted himſelf to them, and ſet himſelf to prepare for that event, which he ſaw could be at no great diſtance; and the better to accompliſh this end, in the month of May 1788, he, by a will and other proper inſtruments, made ſuch an arrangement of his affairs as he meant ſhould take place after his deceaſe.

In this manner he ſpent his time till about the beginning of May 1789, when, finding his appetite fail him in a greater degree than uſual, he had recourſe, as he had ſometimes had before on the ſame occaſion, to the waters of the Iſlington Spa. Theſe he drank for a few mornings; but on the 14th of that month, while he was there, he was, it is ſuppoſed, ſeized with a paralytic affection, as, on his returning to the carriage which waited for him, his ſervants perceived a viſible alteration in his face. On his arrival at home, he went to bed, but got up a few hours after, intending to receive an old friend, from whom he expected a viſit in the evening. At dinner, however, his diſorder returning, he was led up to bed, from which he never roſe, on the 21ſt of the ſame month, about two in the morning, dying of an apoplexy. He was interred on the 28th in the cloiſters of Weſtminſter Abbey, in the north walk near the eaſtern door into the church, under a ſtone, containing, by his expreſs injunctions, no more than the initials of his name, the date of his death, and his age; leaving behind him a high reputation for abilities and integrity, united with the well-earnt character of an active and reſolute magiſtrate, an affectionate huſband and father, a firm and zealous friend, a loyal ſubject, and a ſincere Chriſtian.

Such is the character of him in the Biographical Dictionary, which we have neither right nor inclination to controvert. With none of his works are we acquainted but his edition of *Walton's Complete Angler*, and his *Life of Johnſon*. The former is a very pleaſing book; and in the latter are collected many intereſting anecdotes of literature and literary men; but they are not well arranged, and the ſtyle of the compoſition is coarſe and ſlovenly. Sir John, we doubt not, was a man of worth, and his reflections on the ſentimental ſlang of Sterne and others, ſhew that he had ſucceſsfully ſtudied human nature; but he certainly was not a man of general taſte.

HAWKINS, a county in Waſhington diſtrict, in Tenneſſee, having 6,970 inhabitants, incluſive of 807 ſlaves. Chief town, Rogerſville.—*Morſe.*

HAWKINS *Court Houſe*, in Tenneſſee, is 25 miles from Free-ſtone Gap, 72 from Abington, and 178 from Danville in Kentucky.—*ib.*

HAWK'S BAY, on the coaſt of Weſt-Florida, weſtward of the mouth of Mobile Bay, is between Pelican and Dauphin iſlands. There is a broad channel of 11 and 12 feet water, afterwards ſafe anchorage in 4 fathoms, good holding ground, and ſheltered from moſt winds; on which account it is very convenient for ſmall veſſels.—*ib.*

HAWK'S HARBOUR is an arm of Igornachoix Bay, Newfoundland Iſland.—*ib.*

HAWLEY, a townſhip in Hampſhire county, Maſſachuſetts, 120 miles weſterly of Boſton. Previous to its incorporation in 1792, it was called *Plantation No.* 7, and had 539 inhabitants. It is compoſed of parts of ſeveral adjoining towns, and is about 20 miles N. W. of Northampton.—*ib.*

HAYCOCKS, a ſmall iſle in Delaware river, about 7 miles below Eaſton, in Northampton county, Pennſylvania.—*ib.*

HAYNE'S FORT, COLONEL, is ſituated in Nelſon county, Kentucky, on the north ſide of Green river, 25 miles weſt of Craig's Fort, and 53 from the Ohio.—*ib.*

HEAT. See in this Supplement, CHEMISTRY, Part I. chap. v. where we have endeavoured to eſtabliſh the modern doctrine reſpecting *Caloric* or latent heat. In n° 309, &c. of that article, we have given an account of Count Rumford's ingenious experiments, inſtituted with a view to determine whether or not caloric be a ſubſtance, and have ſtated our reaſons for diſſenting from his opinion. It has been ſuggeſted to us, however, by a friend, to whoſe judgment we are inclined to pay great deference, that it would be proper, in this place, to give the Count's arguments at full length, and in his own words: and the propriety of this is the more apparent, that in the ſupplementary article ELECTRICITY, we have hinted our own ſuſpicions of the non-exiſtence of an *electrical fluid*. The Count then reaſons from his experiments in the following words:

"By meditating on the reſults of all theſe experiments, we are naturally brought to that great queſtion which has ſo often been the ſubject of ſpeculation among philoſophers, namely, What is heat?—Is there any ſuch thing as an *igneous fluid?*—Is there any thing that can with propriety be called caloric?

"We have ſeen that a very conſiderable quantity of heat may be excited in the friction of two metallic ſurfaces, and given off in a conſtant ſtream or flux *in all directions*, without interruption or intermiſſion, and without any ſigns of diminution or exhauſtion.

"From whence came the heat which was continually given off in this manner in the foregoing experiments? Was it furniſhed by the ſmall particles of metal detached from the larger ſolid maſſes on their being rubbed together? This, as we have already ſeen, could not poſſibly have been the caſe.

"Was it furniſhed by the air? This could not have been the caſe; for in three of theſe experiments, the machinery being kept immerſed in water, the acceſs of the air of the atmoſphere was completely prevented.

"Was it furniſhed by the water which ſurrounded the machinery? That this could not have been the caſe is evident; *firſt*, becauſe this water was continually *receiving heat* from the machinery, and could not at the ſame time be *giving to* and *receiving heat from* the ſame body; and, *ſecondly*, becauſe there was no chemical decompoſition of any part of this water. Had any ſuch decompoſition taken place (which indeed could not reaſonably have been expected), one of its compound elaſtic fluids (moſt probably inflammable air) muſt at the ſame time have been ſet at liberty, and, in making its eſcape into the atmoſphere, would have been detected; but though I frequently examined the water to ſee if any air bubbles roſe up through it, and had even made preparations for catching them in order to examine them if any ſhould appear, I could perceive none;

nor was there any ſign of decompoſition of any kind whatever, or other chemical proceſs going on in the water.

"Is it poſſible the heat could have been ſupplied by means of the iron bar to the end of which the blunt ſteel borer was fixed? or by the ſmall neck of gun-metal by which the hollow cylinder was united to the cannon? Theſe ſuppoſitions appear more improbable even than either of thoſe before mentioned; for heat was continually going off or *out of the machinery*, by both theſe laſt paſſages, during the whole time the experiment laſted.

"And, in reaſoning on this ſubject, we muſt not forget to conſider that moſt remarkable circumſtance, that the ſource of the heat generated by friction in theſe experiments appeared evidently to be inexhauſtible.

"It is hardly neceſſary to add, that any thing which any *inſulated* body or ſyſtem of bodies can continue to furniſh *without limitation*, cannot poſſibly be a *material ſubſtance*; and it appears to me to be extremely difficult, if not quite impoſſible, to form any diſtinct idea of any thing capable of being excited and communicated in the manner the heat was excited and communicated in theſe experiments, except it be motion.

"But although the mechaniſm of heat ſhould in fact be one of thoſe myſteries of nature which are beyond the reach of human intelligence, this ought by no means to diſcourage us, or even leſſen our ardour, in our attempts to inveſtigate the laws of its operations. How far can we advance in any of the paths which ſcience has opened to us, before we find ourſelves enveloped in thoſe thick miſts which on every ſide bound the horizon of the human intellect? But how ample and intereſting is the field that is given us to explore?

"Nobody, ſurely, in his ſober ſenſes has ever pretended to underſtand the mechaniſm of gravitation; and yet what ſublime diſcoveries was our immortal Newton enabled to make, merely by the inveſtigation of the laws of its action! The effects produced in the world by the agency of heat are probably *juſt as extenſive* and quite as important, as thoſe which are owing to the tendency of the particles of matter towards each other; and there is no doubt but its operations are in all caſes determined by laws equally immutable."

HEATH, a townſhip in Hampſhire county, Maſſachuſetts, containing 379 inhabitants. It was incorporated in 1785, and is 125 miles N. W. of Boſton, and about 18 miles N. N. W. of Northampton.—*Morſe.*

HEBRON, a town in Cumberland county, Maine, ſituated on the N. E. ſide of Little Androſcoggin, was incorporated in 1792. It is 35 miles N. by W. of Portland.—*ib.*

HEBRON, a townſhip in Waſhington county, New-York, containing 1703 inhabitants, of whom 414 are electors.—*ib.*

HEBRON, a townſhip in Tolland county Connecticut, ſettled in 1704 from Northampton. Moſt of the lands were given by Joſhua, ſachem of the Mohegan tribe, in his laſt will and teſtament. It lies between Lebanon and Glaſtenbury, about 18 miles S. E. of Hartford, and 16 ſouth of Tolland.—*ib.*

HEBRON, a Moravian ſettlement in Pennſylvania, 16 miles from Litiz, which is 70 miles northerly of Philadelphia. This ſettlement began in 1757.—*ib.*

HECTOR, a military townſhip in the State of New-York, on the eaſt ſide of Seneca Lake towards the ſouth end, having Ovid on the north and Newtown townſhip on the ſouth, and 29 miles S. by W. of the ferry on Cayuga Lake.—*ib.*

HEIDELBERG, a Moravian ſettlement in Pennſylvania, begun in 1743; ſituated 24 miles from Litiz, which is in Warwick townſhip, Lancaſter county.—*ib.*

HEIDELBERG, a handſome town in Dauphine county, Pennſylvania, containing about 100 houſes and two German churches for Lutherans and Calviniſts; one of the churches is a handſome ſtone building. It is 33 miles E. by N. of Harriſburg, and 74 N. W. by W. of Philadelphia. There are two other townſhips of this name in the State, the one in York county, the other in that of Northampton.—*ib.*

HEIGHT OF LAND, a range of mountains which extend from S. W. to the N. E. and ſeparates the Diſtrict of Maine from Lower Canada, giving riſe to many rivers which fall into St Lawrence river, and others which fall into the Atlantic Ocean. The principal growth between the Height of Land and St Francis river is beech, maple, birch, hemlock and fir, very few white pines, and no oak of any ſort. Some of the rivers have fine intervales.—*ib.*

HELENA, or ST HELENA. In addition to the account of this iſland in the *Encyclopædia*, the following particulars from Sir George Staunton deſerve a place in this *Supplement*, becauſe ſome of them are important in themſelves, while others correct one or two miſtakes into which we had fallen, by adopting, implicitly, the narrative of Forſter.

The circumference of St Helena meaſures ſomewhat leſs than twenty-eight miles. Along the whole coaſt to leeward, or to the northward, ſhips may anchor in perfect ſecurity in all ſeaſons of the year, but the bank ſhelves ſo abruptly afterwards, that the anchorage, being in deep water, is inſecure. The tide ſeldom riſes above three feet and a half; but the ſurge of the ſea is ſometimes tremendous; and ſeveral accidents happened in approaching or quitting the ſhore, until a wharf was erected, lately, which renders the arrival there, and departure from it, perfectly ſafe. In the immediate neighbourhood of the iſland, ſtorms are little known, thunder is rarely heard, and lightning is ſeldom perceived.

The ſteep eminences which intervene between the valleys, that are the chief ſeats of population, render the communication from one part of this little ſpot to another ſlow and difficult. Planters on the windward ſide of the iſland conſider a journey to the leeward, or ſeat of government, as a ſerious undertaking. Several of them take that opportunity of paying their reſpects to the governor, which is called there ſometimes "going to court." There are St Helena planters who have not travelled ſo far. At preſent, by order of the governor, there are ſignals ſo placed all over the iſland, as to give inſtant notice of the approach of veſſels to any part of it.

In the *Encyclopædia*, it is ſaid that peaches are the only European fruits which thrive in St Helena; but this appears to be a miſtake. Several ſorts of fruit trees imported into the iſland had been deſtroyed by a particular inſect; but encouragement has been given for the cultivation of thoſe which that miſchievous animal is known to ſpare, ſuch as the apple, for example, with all the varieties of which it is ſuſceptible The plantain and banana, or the two ſpecies of the *muſa*, thrive alſo remarkably well. The ground is fertile, and in favourable ſeaſons produces, in ſome inſtances, double crops within the year. Plantations, however, of cotton, indigo, or canes, were not found to anſwer: though ſome good coffee has been produced in it. A botanic garden has been eſtabliſhed near the governor's country houſe. An intelligent gardener has been ſent to take care of it by the company; and a vaſt variety of trees, plants, and flowers of different, and ſometimes oppoſite climates, are already collected in it. The ſurrounding ſea abounds in eſculent fiſh; and ſeventy different ſpecies, including turtle, have been caught upon the coaſts. Whales are ſeen in great numbers playing round the iſland, where it is ſuppoſed the ſouthern whale fiſhery might be carried on to great national advantage.

The country is chiefly cultivated by blacks. Perſons of that colour were brought in a ſtate of ſlavery to it by its firſt European ſettlers; and it ſeldom happens that white men will ſubmit to common work where there are black ſlaves to whom it may be transferred. Theſe were for a long time under the unlimited dominion of their owners, until a repreſentation of the abuſes made of that power induced the India Company to place them under the immediate protection of the magiſtracy, and to enact various regulations in their favour; which have contributed to render them, in a great degree, comfortable and ſecure. Theſe regulations may have hurt, at firſt, the feelings of the owners of ſlaves, but not their real intereſt; for it appears, that before their introduction there was a loſs, upon an average, of about ten in a hundred ſlaves every year, to be ſupplied at a very heavy expence; whereas, under the preſent ſyſtem, they naturally increaſe. All future importation of ſlaves into the iſland is prohibited.

Beſides the blacks in a ſtate of ſlavery, there are ſome who are free. The labour of theſe tending to diminiſh the value of that of ſlaves, the free blacks became once obnoxious to ſome ſlave owners; who had ſufficient influence, in a grand jury, to preſent them as without viſible means of gaining a livelihood, and liable to become burdenſome to the community; but upon examination, it appeared that all free blacks of age to work were actually employed; that not one of them had been tried for a crime for ſeveral years, nor had any of them been upon the pariſh. They are now by the humane interpoſition of the company placed under the immediate protection of the government, and put nearly upon a footing with the other free inhabitants, who, when accuſed of crimes, have the privilege of a jury, as well as in civil cauſes.

The principal ſettlement of St Helena has the peculiar advantage of uniting the ſhelter of a leeward ſituation with the coolneſs of windward gales. The ſouth-eaſt wind blows conſtantly down the valley, rendering a reſidence in it pleaſant as well as healthy. The country is ſo fertile, and the climate ſo congenial to the human feelings, that perhaps it would be difficult to find out a ſpot where perſons, not having acquired a reliſh for the enjoyments of the world, or already advanced in life, and ſurfeited with them, could have a better chance of protracting their days in eaſe, health and comfort.

HELENA ISLAND, ST, on the coaſt of S. Carolina, with the continent on the north, forms St Helena Sound or Entrance, and gives name to a pariſh in Beaufort diſtrict.—*Morse.*

HELENA PARISH, ST, in Beaufort diſtrict, S. Carolina, conſiſts of a cluſter of iſlands, on the S. W. ſide of St Helena Iſland, one of the largeſt of which is Port Royal. Adjacent to Port Royal are St Helena, Ladies, Paris, and Hunting Iſlands. The Hunting Iſlands are 5 or 6 in number, bordering on the ocean, ſo called from the number of deer and other game found upon them. All theſe iſlands, and ſome others of leſs note belong to this pariſh. The produce of the iſlands is rice, indigo, cotton, corn, and ſweet potatoes; the cultivation of which, as well as in other parts of the State, is entirely carried on by ſlaves. Taxes paid by St Helena pariſh £1,144 : 13 : 2. Chief town, Beaufort, on Port Royal iſland.—*ib.*

HELENA, ST, a town on the coaſt of Florida, built by the Spaniards, and burnt by Sir Francis Drake in 1585.—*ib.*

HELICOID PARABOLA, or the *Parabolic Spiral* is a curve ariſing from the ſuppoſition that the common or Apollonian parabola is bent or twiſted, till the axis come into the periphery of a circle, the ordinates ſtill retaining their places and perpendicular poſitions with reſpect to the circle, all theſe lines ſtill remaining in the ſame plane.

HELISPHERICAL LINE, is the Rhumb line in Navigation; being ſo called, becauſe on the globe it winds round the pole helically or ſpirally, coming ſtill nearer and nearer to it.

HELL GATE, this celebrated ſtrait is near the weſt end of Long Iſland Sound, oppoſite to Harlem in York Iſland, and about 8 miles north-eaſt of New-York city, and is remarkable for its whirlpools, which make a tremendous roaring at certain times of the tide. Theſe whirlpools are occaſioned by the narrowneſs and crookedneſs of the paſſage, and a bed of rocks which extend quite acroſs it; and not by the meeting of the tides from eaſt to weſt, as has been conjectured, becauſe they meet at Frog's Point, ſeveral miles above. A ſkilful pilot may conduct a ſhip of any burden, with ſafety, through this ſtrait, at high water with the tide, or at low water with a fair wind. There is a tradition among the Indians, that in ſome diſtant period, in former times, their anceſtors could ſtep from rock to rock, and croſs this arm of the ſea on foot at Hell Gate.—*Morse.*

HEMLOCK, a lake in New-York State, 12 miles long, and 1 broad, in the Genneſſee country.—*ib.*

HEMPFIELD, the name of two townſhips in Pennſylvania, the one in Lancaſter county, the other in that of Weſtmoreland.—*ib.*

HENDERSON'S GRANT, a tract 12 miles ſquare, on the peninſula formed by the junction of Green river with the Ohio, in the State of Kentucky.—*ib.*

HENIOCHAS, or HENIOCHUS, a northern conſtellation, the ſame as Auriga, which ſee *Encycl.*

HENLEY HOUSE, a ſtation of the Hudſon's Bay Company, on the north bank of Albany river, in New S. Wales, 150 miles S. W. of Albany Fort, and 110 N. W. by W. of Brunſwick Houſe. N. lat. 51° 14′ 27″. W. long. 85° 5′ 54″.—*Morse.*

HENNIKER, a townſhip in Hillſborough county, New-Hampſhire, about 12 miles weſt of Concord. In 1775, it contained 367, and in 1790, 1127 inhabitants.—*ib.*

HENLOPEN, CAPE, forms the S. W. ſide of the entrance of Delaware Bay, and Cape May the N. E. ſide, 28 miles apart. Cape Henlopen lies in N. lat. 38° 50′, and in W. long. 75° 26′. There is a lighthouſe here, a few miles below the town of Lewis, of an octagon form, handſomely built of ſtone 115 feet high, and its foundation is nearly as much above the level of the ſea. The lantern is between 7 and 8 feet ſquare, lighted with 8 lamps, and may be ſeen in the night 10 leagues off at ſea. Its annual expenſe is about £650. There is a ſtrong iron net-work, in order to prevent birds from breaking the glaſs at night. Yet ſo attractive is the light to the winged tribe, that ſhortly after its erection, 110 birds of different kinds were found dead one morning, and a duck, in particular flew againſt it with ſuch force, as to penetrate through both the wire and glaſs, and was found dead in the lantern. Since the above accident, few ſimilar ones have occurred, and the birds have become more wary.

Veſſels off the Delaware, upon diſplaying a jack at the foretopmaſt-head, will be immediately furniſhed with a pilot. None, however, are to be depended upon, unleſs they are furniſhed with branches, and with a certificate from the board of wardens of Philadelphia.—*ib.*

HENRICO, a county of Virginia, about 30 miles long, and 7 broad, contains 12,000 inhabitants, including 5819 ſlaves. It is ſurrounded by Hanover, Charles City, and Goochland counties, and James river. A number of coal mines are in the county, and pits have been opened by many of the proprietors, and worked to conſiderable profit. The coals in ſeveral of the pits are found nearly 200 feet above the level of the river, and 3 or 4 feet below the ſurface of the ground. It is ſuppoſed that 500,000 buſhels might be raiſed from one of theſe in a year. Chief town, Richmond.—*ib.*

HENRIQUELLE, a remarkable ſalt-pond in the Spaniſh part of the iſland of St. Domingo, about 22 leagues in circuit. It is inhabited by lizards and alligators, and land tortoiſes, all of a large ſize. The water is deep, clear, bitter and ſalt, and has a diſagreeable ſmell. Near the middle of this pond is an iſland about 2 leagues long, and a league wide, in which is a ſpring of freſh water, well ſtocked with *cabritoes*, and thence called *Cabrito iſland.* This pond is about 11 leagues E. of Port-au-Prince.—*ib.*

HENRY, a cape, the north-eaſtern extremity of Princeſs Ann county, in Virginia, 12 miles S. by W. of Cape Charles in Northampton county. Theſe capes form the entrance of Cheſapeak Bay. Cape Henry lies in N. lat. 37°, W. long. 76° 16′.—*ib.*

HENRY, a fort in Pennſylvania, 8 miles N. by W. of Myer's TOWN, at the head of Tulpehocken creek, 32 N. of Lancaſter, and nearly 37 S. E. of Sunbury. —*ib.*

HENRY, a mountainous and hilly county of Virginia, bounded N. by Franklin, S. and S. E. by Patrick, S. W. by Griſon, and N. W. and W. by Montgomery. It is about 40 miles long, 15 broad, and contains 6928 inhabitants, including 1551 ſlaves.—*ib.*

HERKEMER, a new county of New-York, divided into 20 townſhips, viz. German Flats, Warren, Frankfort, and Litchfield, formed out of *German flats* in Feb. 1796. Herkemer, Fairfield and Norway, formed out of *Fairfield*, Feb. 1796.—Schuyler. The following were comprehended originally in *Whiteſtown*, viz. Paris, Sangerfield, Hamilton, Sherburn, Brookfield, Cazenovia, Weſtmoreland, Mexico, Rome, Steuben and Floyd. By the State cenſus of 1796 this county contains 25,573 inhabitants, of whom 4161 are electors. It is bounded N. by part of Lower Canada and the river St Lawrence, N. W. by the E. end of Lake Ontario, and the river St Lawrence; S. by Otſego county; E. by Clinton and part of Waſhington county.—*ib.*

HERKEMER TOWN, in the above county, is ſituated on the north ſide of Mohawk river. The townſhip includes the village called Little German Flats, and the celebrated plain called German Flats. The village contains a court-houſe, gaol, a Dutch church, and about 40 dwelling houſes, which laſt are very indifferent buildings. It is 80 miles N. W. by W. of Albany, 16 S. E. of old Fort Schuyler, and 20 in a like direction from Whiteſtown. In the midſt of the flats is a ſhrub oak plain of 80 or 100 acres, barren and ſtony, of no uſe but for building lots. The townſhip is named in honour of general Herkemer, who was mortally wounded in the late war. It contained in 1796, by the State cenſus, 2073 inhabitants; of whom 338 were electors.—*ib.*

HERO, NORTH, an iſland in Lake Champlain, is a townſhip annexed to Chittenden county in Vermont, and contains 125 inhabitants. It is 13 miles in length, and 2 in breadth.—*ib.*

HERO, SOUTH, an iſland in the ſame lake, belonging to Chittenden county, Vermont, is a townſhip and port of entry, and contains 537 inhabitants. It is 14 miles long, and 3½ broad. Numerous ſmall iſles ſurround the Heros. This iſland produces good crops of wheat and other grain. In it is a quarry of bluiſh grey marble, which has the appearance of being a petrifaction of ſcallops, a ſpecies of ſhell common in the vicinity of the lake, together with the common earth of the ſhore, which is of a marley ſubſtance.—*ib.*

HERON, PASS AU, at the bay of Mobile, in W. Florida, is 18 miles E. of Paſcagoula river, and has 4 feet water; and from thence to the point which is on the E. ſide of the bay of Mobile, in N. lat. 30° 17′ is nearly 6 miles.—*ib.*

HERRING BAY, lies on the W. ſide of Cheſapeak Bay, Maryland, 26 miles S. of Annapolis, and derives its name from the fiſh of its name which frequent it.—*ib.*

HERSCHEL, the name by which the French, and moſt other European nations, call the new planet diſcovered by Dr Herſchel in the year 1781. Its mark or character is ♅. The Italians call it Ouranos, or Urania; but the Engliſh, the Georgian planet, or Georgium Sidus.

HERTFORD, a county of Edenton diſtrict, N. Carolina; bounded N. by the State of Virginia, S. by Bertie county, E. by Chowan, and W. by Northampton, and contains 5828 inhabitants, of whom 2442 are ſlaves. Chief town, Wynton.—*Morſe.*

HETERODROMUS Vectis, or Lever, in Mechanics, a lever in which the fulcrum or point of ſuſpenſion is between the weight and the power; being the ſame as what is otherwiſe called a lever of the firſt kind.

HIATSTOWN, a village in Middleſex county, New-Jerſey; 13 miles northeaſterly of Trenton, and 17 S. by W. of New-Brunſwick.—*Morſe.*

HICKMAN'S, a ſettlement in Fayette county, Kentucky, on the N. ſide of Kentucky river, 10 miles N. of Danville, and 22 S. of Lexington.—*ib.*

HID ISLAND is ſituated in the N. W. Territory; in Plein river, the northern head water of the Illinois.—*ib.*

HIGHGATE, a village in Georgia, about 4 miles from Savannah.—*ib.*

Highgate, the north-weſternmoſt townſhip except Alburgh, in Vermont, in Franklin county, contains 103 inhabitants.—*ib.*

HIGHLANDS, a mountainous tract of country on the banks of Hudſon's river, in the State of New-York, between 40 and 60 miles N. of New-York city. The paſſage on the river through theſe Highlands, for the diſtance of about 18 miles, is grand and romantic in a high degree. The opening ſeems to have been formed on purpoſe for the paſſage of this noble river. In theſe highlands are ſituated the important and famous fortreſſes of Weſt Point, Fort Montgomery, and Stoney Point. The moſt noted peaks are, as you aſcend the river, Thunder Hill, St Anthony's Noſe, Sugar Loaf, Butter Hill, and Break Neck Hill. After paſſing the two laſt, the country opens delightfully, and preſents to the eye the pleaſant villages of New-Windſor and Newburgh. Theſe mountains abound with iron ore.—*ib.*

HIGUEY, or *Alta Gracia*, a city in the S. E. part of the Spaniſh diviſion of St Domingo, the eaſternmoſt of all the ſettlements in the iſland, celebrated formerly for its fertility, and the quantity of ſugar it produced. It was formerly the ſeat of *Cayacoa*, the moſt powerful cacique of the iſland. It has now only about 500 inhabitants, and is diſtant about 40 leagues to the eaſtward of St Domingo, between which and Higuey are three roads, the circuitous and northernmoſt of which leads by Bayaguana. N. lat. 18° 30′.—*ib.*

HILLSBOROUGH, an iſland on the Labrador coaſt, on a bay at the head of which is Nain.—*ib.*

Hillsborough, a county of New-Hampſhire, bounded N. by Grafton county, S. by the State of Maſſachuſetts, W. by Cheſhire, and E. by Rockingham county.

It is divided into 37 townſhips and 4 gores of land, which contain 32,871 inhabitants, all free people, who chiefly follow agriculture. The academy at Amherſt, has £800 funds, and another at New-Ipſwich of £1000. Chief towns, Amherſt and Hopkinton.—*ib.*

Hillsborough, a townſhip in the above county, ſituated on the northern head branches of Contocook river, about 18 or 20 miles W. of Concord, was incorporated in 1772, and contains 798 inhabitants.—*ib.*

Hillsborouh, a townſhip in Somerſet county, New-Jerſey, containing 2,201 inhabitants, including 386 ſlaves. It is about 15 miles W. of Brunſwick, and 18 northerly of Trenton.—*ib.*

Hillsborough, a village on the eaſtern ſide of Cheſapeak Bay, in Caroline county, Maryland; ſeated on the E. ſide of Tuckahoe Creek, one of the chief branches of Choptank river, 7 miles S. E. by E. of Denton, 9 N. W. of Greenſborough, and 27 S. S. W. of Cheſter.—*ib.*

Hillsborough, one of the middle diſtricts of North-Carolina, bounded N. by the State of Virginia, S. by Fayetteville diſtrict, E. by Halifax, and W. by Saliſbury. It comprehends the counties of Granville, Perſon, Caſwell, Orange, Wake, Chatham, and Randolph; and contains 59,983 inhabitants, of whom 13,506 are ſlaves. Chief town, Hillſborough.—*ib.*

Hillsborough, a poſt-town of North-Carolina, and capital of the diſtrict of its name, is ſituated in Orange county, on the N. ſide of Eno river, in a high, healthy and fertile country. It contains about 80 houſes, a court-houſe and gaol; and had in 1788 an academy of 60 or 80 ſtudents, patronized by the principal gentlemen of the State. The Eno unites with Little and Flat rivers, and forms the Neus, about 17 miles below the town. It is 180 miles W. N. W. of Newbern, 26 S. by W. of Perſon court-houſe, 101 W. by S. of Halifax, 110 E. N. E. of Saliſbury, and 452 S. W. by S. of Philadelphia.—*ib.*

HILLSDALE, a townſhip in Columbia county, New-York, 18 miles from Hudſon city, containing 4556 inhabitants, including 31 ſlaves. By the State cenſus of 1796, 622 of the inhabitants are electors.—*ib.*

HILLTOWN, a ſmall town near the centre of Cheſter county, Pennſylvania; 28 miles W. of Philadelphia, and 21 N. W. of Cheſter. Alſo the name of a townſhip in Bucks county in the ſame State.—*ib.*

HILTON HEAD is the moſt ſouthern ſea land in S. Carolina. W. and S. W. of Hilton Head lie Pinckney's Bulls, Dawfuſkies and ſome ſmaller iſlands, between which and Hilton Head, are Calibogie river and ſound, which form the outlet of May and New rivers.—*ib.*

Hilton's Point, in Paſcataqua river, in New-Hampſhire, is the ſpot where the united ſtream of Newichawannock and Cochecho rivers, which comes from Dover, meets the weſtern branch and forms the Piſcataqua: From thence to the ſea is 7 miles, the courſe generally S. to S. E. and the river is ſo rapid that it never freezes.—*ib.*

HINCHE, a territory and town in the Spaniſh part of St Domingo. The canton of Hinche is bounded W. by the French pariſhes of Gonaives, Petit Riviere and Mirebalais—and contains with ſome appendages about 12,000 ſouls. The town contains about 500 houſes, and, together with its dependencies, 4,500 ſouls, 500 of whom are capable of bearing arms. It is ſituated on the E. ſide of the mouth of the river Guayamuco, 64 miles N. W. of St Domingo, N. lat. 19° 3′.—*ib.*

HINESBURGH, a townſhip in Chittenden county, in Vermont, lies E. of and joins Charlotte on Lake Champlain. It contains 454 inhabitants.—*ib.*

HINGHAM, a poſt-town in Suffolk county, Maſſachuſetts, ſituated on a ſmall bay which ſets up ſouth from Boſton Bay. It contains a number of houſes compactly built, two Congregational churches, and a well endowed ſchool, called, in honour of its principal donor and founder, Derby School. It is 19 miles S. E. of Boſton, and 22 in a like direction from Plymouth. The townſhip is about 4 miles ſquare, conſiſts of two pariſhes, was incorporated in 1635, and contains 2,085 inhabitants. Here are 6 griſt-mills, 3 ſaw-mills, and a fulling-mill; four of which are tide mills. Two hills in this town, one of which is called Baker's Hill, preſent extenſive and delightful proſpects of Boſton Bay, its iſlands, and the adjacent country.—*ib.*

HINSDALE, the S. eaſternmoſt townſhip in Vermont, and in Windham county. It contains 482 inhabitants.—*ib.*

HINSDALE, a townſhip in Cheſhire county, New-Hampſhire, on the eaſt bank of Connecticut river, where the ſouth line of the State ſtrikes the river in 42° 43′ 59″ N. lat. and is oppoſite to Hinſdale in Vermont. It was incorporated in 1753, and contains 522 inhabitants. It is about 38 miles above Northampton.—*ib.*

HINZUAN, the proper name of one of the Comora iſlands, which by different writers of different nations has been called *Anzuame*, *Anjuan*, *Juanny*, and *Johanna*, and which is deſcribed in the *Encyclopædia* under the name of St Joanna. In that article, it is obſerved, that an anonymous writer has cenſured the deſcriptions of this iſland given by the Abbé Reynal and Major Rooke, as being not only exaggerated, but erroneous; neither the country being ſo picturesque as the former repreſents it, nor the inhabitants meriting the reſpectable character given of them by the latter.

There was not perhaps much propriety in admitting into ſuch a work as the *Encyclopædia* the anonymous cenſure of deſcriptions, authenticated by the names of reſpectable authors; but the beſt reparation which we can make to thoſe authors, is, to inform our readers, that their deſcriptions of Hinzuan are confirmed by Sir William Jones, whoſe teſtimony, we believe, no man will controvert. That accompliſhed ſcholar, who viſited the iſland on his voyage to India, thus deſcribes its appearance from the bay in which the ſhip rode at anchor.

"Before us was a vaſt amphitheatre, of which you may form a general notion by picturing in your minds a multitude of hills infinitely varied in ſize and figure, and then ſuppoſing them to be thrown together, with a kind of artleſs ſymmetry, in all imaginable poſitions. The back ground was a ſeries of mountains, one of which is pointed, near half a mile perpendicularly high from the level of the ſea, and little more than three miles from the ſhore, all of them richly clothed with wood, chiefly fruit trees, of an exquiſite verdure. I had ſeen many a mountain of ſtupendous height in Wales and Swiſſerland, but never ſaw one before, round the boſom of which the clouds were almoſt continually rolling, while its green ſummit roſe flouriſhing above them, and received from them an additional brightneſs. Next to this diſtant range of hills was another tier, part of which appeared charmingly verdant, and part rather barren; but the contraſt of colours changed even this nakedneſs into a beauty: nearer ſtill were innumerable mountains, or rather cliffs, which brought down their verdure and fertility quite to the beach; ſo that every ſhade of green, the ſweeteſt of colours, was diſplayed at one view by land and by water. But nothing conduced more to the variety of this enchanting proſpect, than the many rows of palm-trees, eſpecially the tall and graceful *Arecas*, on the ſhores, in the valleys, and on the ridges of hills, where one might almoſt ſuppoſe them to have been planted regularly by deſign. A more beautiful appearance can ſcarce be conceived, than ſuch a number of elegant palms in ſuch a ſituation, with luxuriant tops, like verdant plumes, placed at juſt intervals, and ſhowing between them part of the remoter landſcape, while they left the reſt to be ſupplied by the beholder's imagination. The town of *Matſamúdò* lay on our left, remarkable at a diſtance for the tower of the principal moſque, which was built by Halímah, a queen of the iſland from whom the preſent king is deſcended: a little on our right was a ſmall town called *Bantâni.* Neither the territory of *Nice*, with its olives, date trees and cypreſſes, nor the iſles of *Hieres*, with their delightful orange groves, appeared ſo charming to me, as the view from the road of *Hinzúàn.*"

Sir William Jones, ſpeaking of the inhabitants, takes notice of the *Lords*, *Dukes* and *Princes*, of whom we have made mention after major Rooke. "The frigate, (ſays he) was preſently ſurrounded with canoes, and the deck ſoon crowded with natives of all ranks, from the high born chief, who waſhed linen, to the half-naked ſlave who only paddled. Moſt of them had letters of recommendation from Engliſhmen, which none of them were able to read, though they ſpoke Engliſh intelligibly; and ſome appeared vain of titles, which our countrymen gave them in play, according to their ſuppoſed ſtations: we had *Lords*, *Dukes*, and *Princes* on board, ſoliciting our cuſtom, and importuning us for preſents. In fact, they were too ſenſible to be proud of empty ſounds, but juſtly imagined, that thoſe ridiculous titles would ſerve as marks of diſtinction, and, by attracting notice, procure for them ſomething ſubſtantial." He ſpeaks with great reſpect of the king, whoſe name was *Ahmed*, as well as of ſeveral chiefs whom he ſaw, and ſeems to have met with no man of rank on the iſland whoſe character was contemptible, but Selim the king's eldeſt ſon. For the behaviour of that prince, the old ſovereign made the beſt apology that he could, while he privately aſſured the interpreter, that he was much diſpleaſed with it, and would not fail to expreſs his diſpleaſure. He concluded his converſation with a long harangue on the advantage which the Engliſh might derive from ſending a ſhip every year from Bombay to trade with his ſubjects, and on the wonderful cheapneſs of their commodities, eſpecially of their cowries. Ridiculous as this idea might ſeem, it ſhowed (ſays Sir William) an enlargement of mind, a deſire of promoting the intereſt of his people, and a ſenſe of the benefits ariſing from trade, which could hardly have been expected from a petty African chief, and which, if he had been ſovereign of Yemen, might have been expanded into rational projects proportioned to the extent of his dominions.

The maſter of the frigate learned from one of the chiefs a few curious circumſtances concerning the government of *Hinzuan;* which he found to be a monarchy limited by an ariſtocracy. The king, he was told, had no power of making war by his own authority; but, if the aſſembly of nobles, who were from time to time convened by him, reſolved on a war with any of the neighbouring iſlands, they defrayed the charges of it by voluntary contributions ; in return for which, they claimed as their own all the booty and captives that might be taken. The hope of gain or the want of ſlaves, is uſually the real motive for ſuch enterpriſes, and oſtenſible pretexts are eaſily found : at that very time, he underſtood they meditated a war, becauſe they wanted hands for the following harveſt. Their fleet conſiſted of ſixteen or ſeventeen ſmall veſſels, which they manned with about two thouſand five hundred iſlanders, armed with muſkets and cutlaſſes, or with bows and arrows. Near two years before they had poſſeſſed themſelves of two towns in *Mayáta*, which they ſtill kept and garriſoned. The ordinary expences of the government were defrayed by a tax from two hundred villages ; but the three principal towns were exempt from all taxes, except that they paid annually to the chief *Mufti* a fortieth part of the value of all their moveable property, and from that payment neither the king nor the nobles claimed an exemption. The kingly authority, by the principles of their conſtitution, was conſidered as elective, though the line of ſucceſſion had not in fact been altered ſince the firſt election of a ſultan.

Sir William Jones concludes his remarks on this iſland with ſome reflections ; of which, though they may be conſidered as digreſſive, we are perſuaded our readers will approve of our extending the circulation.

" We have lately heard of civil commotions in *Hinzuan*, which, we may venture to pronounce, were not excited by any cruelty or violence of Ahmed, but were probably occaſioned by the inſolence of an oligarchy naturally hoſtile to king and people. That the mountains in the *Comara* iſlands contain diamonds, and the precious metals, which are ſtudiouſly concealed by the policy of the ſeveral governments, may be true, though I have no reaſon to believe it, and have only heard it aſſerted without evidence ; but I hope, that neither an expectation of ſuch treaſures, nor of any other advantage, will ever induce an European power to violate the firſt principles of juſtice by aſſuming the ſovereignty of *Hinzuan*, which cannot anſwer a better purpoſe than that of ſupplying our fleets with ſeaſonable refreſhment ; and, although the natives have an intereſt in receiving us with apparent cordiality, yet, if we wiſh their attachment to be unfeigned and their dealings juſt, we muſt ſet them an example of ſtrict honeſty in the performance of our engagements. In truth, our nation is not cordially loved by the inhabitants of *Hinzuan*, who, as it commonly happens, form a general opinion from a few inſtances of violence or breach of faith. Not many years ago an European, who had been hoſpitably received and liberally ſupported at *Matſamudo*, behaved rudely to a young married woman, who, being of low degree, was walking veiled through a ſtreet in the evening : her huſband ran to protect her, and reſented the rudeneſs, probably with menaces, poſſibly with actual force ; and the European is ſaid to have given him a mortal wound with a knife or bayonet, which he brought, after the ſcuffle, from his lodging. This foul murder, which the law of nature would have juſtified the magiſtrate in puniſhing with death, was reported to the king, who told the governor (I uſe the very words of Alwi a couſin of the king's), that " it would be wiſer to huſh it up." Alwi mentioned a civil caſe of his own, which ought not to be concealed. When he was on the coaſt of Africa in the dominions of a very ſavage prince, a ſmall European veſſel was wrecked ; and the prince not only ſeized all that could be ſaved from the wreck, but claimed the captain and the crew as his ſlaves, and treated them with ferocious inſolence. Alwi aſſured me, that, when he heard of the accident, he haſtened to the prince, fell proſtrate before him, and by tears and importunity prevailed on him to give the Europeans their liberty ; that he ſupported them at his own expence, enabled them to build another veſſel, in which they ſailed to *Hinzuan*, and departed thence for Europe or India : he ſhewed me the captain's promiſſory notes for ſums, which to an African trader muſt be a conſiderable object, but which were no price for liberty, ſafety, and, perhaps, life, which his good, though diſintereſted offices had procured. I lamented that, in my ſituation, it was wholly out of my power to aſſiſt Alwi in obtaining juſtice ; but he urged me to deliver an *Arabic* letter from him, encloſing the notes, to the governor-general, who, as he ſaid, knew him well ; and I complied with his requeſt. Since it is poſſible, that a ſubſtantial defence may be made by the perſon thus accuſed of injuſtice, I will not name either him or the veſſel, which he had commanded ; but, if he be living, and if this paper ſhould fall into his hands, he may be induced to reflect how highly it imports our national honour, that a people, whom we call ſavage, but who adminiſter to our convenience, may have no juſt cauſe to reproach us with a violation of our contracts."

HIPS, in architecture, are thoſe pieces of timber placed at the corners of a roof. Theſe are much longer than the rafters, becauſe of their oblique poſition. Hip means alſo the angle formed by two parts of the roof, when it riſes outwards.

Hip-Roof, called alſo Italian roof, is one in which two parts of the roof meet in an angle, riſing outwards : the ſame angle being called a valley, when it ſinks inwards.

HIRCUS, in aſtronomy, a fixed ſtar of the firſt magnitude, the ſame with capella.

Hircus is alſo uſed by ſome writers for a comet, encompaſſed as it were with a mane, ſeemingly rough and hairy.

HIRUDO. See *Encycl.* A new ſpecies of this inſect was diſcovered in the South Sea by Le Martiniere, naturaliſt in Perouſe's voyage of diſcovery. He found it buried about half an inch in a ſhark's liver, but could not conceive how it had got thither. It was ſomething more than an inch long, of a whitiſh colour, and compoſed of ſeveral rings ſimilar to thoſe of the tænia. The ſuperior part of its head was furniſhed with four ſmall ciliated mamillæ, by which it took its food ; under each mamilla on both ſides was a ſmall oblong pouch, in the form of a cup ; and in the form of its *inſtrumenta cibaria*, it very nearly reſembles the animal which has been ſuppoſed to be the cauſe of meaſles in ſwine. Both theſe ſpecies are referable to the genus *hirudo*, the characters of which, as given by Linnæus, ſtand (ſays Martiniere) in need of reformation.

HIRUNDO Esculenta (ſee Hirundo, *Encycl.* n° 3.), is thus deſcribed in the *Tranſactions of the Batavian Society in the Iſland of Java*, vol. iii. ; and the deſcription confirms the ſagacious conjecture of Mr

Latham reſpecting the ſize of the bird, which the reader will find in our article referred to.

"The hirundo eſculenta is of a blackiſh grey colour, inclining a little to green; but on the back to the tail, as well as on the belly, this blackiſh colour gradually changes into a mouſe colour. The whole length of the bird from the bill to the tail is about four inches and a half, and its height from the bill to the extremity of the middle toe three inches and a quarter. The diſtance from the tip of the one wing to that of the other, when extended, is ten inches and a quarter. The largeſt feathers of the wings are about four inches in length. The head is flat; but, on account of the thickneſs of the feathers, appears round, and to be of a large ſize in proportion to the reſt of the body. The bill is broad, and ends in a ſharp extremity, bent downwards in the form of an awl. The width of it is increaſed by a naked piece of ſkin ſomewhat like parchment, which, when the bill is ſhut, lies folded together; but which, when the bill opens, is conſiderably extended, and enables the bird to catch with greater eaſe, while on wing, the inſects that ſerve it for food. The eyes are black, and of a conſiderable ſize. The tongue, which is not forked, is ſhaped like an arrow. The ears are flat, round, naked ſpots, with ſmall oblong openings, and are entirely concealed under the feathers of the head. The neck is very ſhort, as well as the legs and the bones of the wings. The thighs are wholly covered with feathers; and the very tender lower parts of the legs, and the feet themſelves, are covered with a ſkin like black parchment. Each foot has four toes, three of which are before and one turned backwards. They are all detached from each other to the roots; and the middle one, together with the claw, is fully as long as the lower part of the leg. Each toe is furniſhed with a black, ſharp, crooked claw of a conſiderable length, by which the animal can with great facility attach itſelf to crags and rocks. The tail is fully as long as the body together with the neck and the head. When expanded it has the form of a wedge, and conſiſts of ten large feathers. The four firſt on each ſide are long; and, when the tail is cloſed, extend almoſt an inch beyond the reſt. The other feathers decreaſe towards the middle of the tail, and are equal to about the length of the body."

There is a variety of this ſpecies of hirundo, with a ſpeckled breaſt, and white ſpots on the tail feathers; and this, though leſs numerous than the other, and indeed not found at all in Java, appears to have been the only hirundo eſculenta known to Linnæus. For an account of the eatable neſts of theſe birds, and the manner of collecting them, ſee Cap and Button in this *Supplement.*

HISPANIOLA, or St Domingo, the largeſt of the Antilles or Caribbee iſlands, has been deſcribed, as it exiſted prior to the French revolution, in the *Encyclopædia.* Previous to the year 1789 the government of the French part of the iſland was adminiſtered by an officer called the Intendant, and a Governor-General, both nominated by the crown, and inveſted with authority for three years. Their powers were in ſome caſes diſtinct, and in others united; but though theſe powers were extenſive and almoſt abſolute, the attention which the old government of France paid to the character and rank of thoſe perſons whom it had placed over its foreign ſettlements, ſecured to the inhabitants of Hiſpaniola a very conſiderable ſhare of happineſs. In ſpite of what our reſtleſs innovators call political evils, ſigns of proſperity were everywhere viſible; their towns were opulent, their markets plentiful, their commerce extenſive, and their cultivation increaſing.

Such was, in 1788, the ſtate of the French colony in the iſland of St Domingo; but in that eventful year, the flame, which had burſt forth in Europe, ſpread itſelf to the Weſt-Indies. An aſſociation had been formed in France upon principles ſomewhat ſimilar to thoſe of our ſociety for the abolition of the ſlave trade; but that aſſociation, which called itſelf *Amis des Noirs*, had much more dangerous deſigns than ours. Avowing its deteſtation of every kind of ſlavery, as well as of the African trade, and condemning thoſe abettors of liberty who dared to declare themſelves poſſeſſors of men, its members kept up an intimate and clandeſtine connection with thoſe rich mulattoes who reſided in France for their education, and laboured to convince them that neither their colour nor their *ſpurious birth* ſhould make any civil or political diſtinction between them and the whites who were born in *wedlock.* To co-operate, as it were, with theſe factious and falſe doctrines, the National Aſſembly iſſued its famous declaration, in which it was maintained that all mankind are born, and continue free, and equal in their rights. The conſequence of this was ſuch as might have been expected. The mulattoes of Hiſpaniola inſtructed in the French philoſophy of the rights of man, broke out into rebellion; but not acting in concert, they were quickly overpowered.

The ſpirit, however, which had been excited among them, ſtill continued to ferment; and the National Aſſembly of France, taking the ſtate of the iſland into ſolemn conſideration, decreed, by a great majority, that its intention had never been to intermeddle with the internal affairs of the colony; that their internal legiſlation was entirely their own; and that the legiſlature of the mother country would make no innovation, directly or indirectly, in the ſyſtem of commerce in which the colonies were already concerned. However grateful this declaration might be to the whites of St Domingo, and in the then ſtate of things however wiſe in itſelf, it occaſioned diſcontent and remonſtrances on the part of the factious friends of the negroes. They regarded it as an unwarrantable ſanction of the African traffic, and a confeſſion, that the planters of Hiſpaniola were not coloniſts, but an independent people.

The coloniſts themſelves, indeed, or rather their repreſentatives, ſeem to have thought that by this decree they were rendered independent; for in their general aſſembly they paſſed an act debarring the king's delegate, the governor general, from negativing any of their future acts. This violent meaſure was far from giving univerſal ſatisfaction. The weſtern pariſhes recalled their delegates, while thoſe of Cape François renounced their obedience to the whole aſſembly, and petitioned the governor to diſſolve it.

During theſe diſſenſions, the commander of a ſhip of the line, which lay in the harbour of Port-au-Prince, gave a ſumptuous entertainment to the friends of the governor; on which account the ſeamen, who declared themſelves in the intereſt of the aſſembly, thought fit to mutiny; and the aſſembly, in return, voted their thanks to the mutineers. Some of their partizans, ſeizing

ing at the ſame time a powder magazine, the governor declared them adherents to traitors, and called on all officers, civil and military, to bring them to puniſhment. This was the ſignal for civil inſurrection; armed troops took the field on both ſides; and war ſeemed inevitable, when the aſſembly reſolved to repair in a body to France and juſtify their paſt conduct.

In the mean time the *Amis des Noirs* contrived to excite the people of colour to rebellion. They initiated in the doctrine of equality and the rights of man one James Oge, then reſiding in Paris in ſome degree of affluence. They perſuaded him to go to St Domingo, put himſelf at the head of his people, and deliver them from the oppreſſion of the whites; and in order to evade the notice of government, they undertook to procure for him arms and ammunition in America. He embarked accordingly, July 1790, for New England with money and letters of credit; but notwithſtanding the caution of the *Amis des Noirs*, his deſigns were diſcovered by the French government, and his portrait was ſent out before him to St Domingo. He landed on the iſland in October, and ſix weeks afterwards publiſhed a manifeſto, declaring his intention of taking up arms, if the privileges of whites were not granted to *all perſons without diſtinction*. He was joined by about 200 men of colour; and this little army of ruffians not only maſſacred the whites wherever they fell in with them in ſmall numbers, but, by a ſtill more unjuſtifiable mode of conduct, took vengeance on thoſe of their own colour who refuſed to join their rebellious ſtandard. They were, however, ſoon overpowered by the regular troops; and their leader, after diſcloſing, it is ſaid, ſome important ſecrets, ſuffered the puniſhment due to his treaſon.

While theſe things were going on in the iſland, the members of the Colonial Aſſembly arrived at Paris, where they were received by the repreſentatives of the French people with marked ſymptoms of averſion. The reſolutions compoſing their famous decree were pronounced improper; their vote of thanks to the mutineers was declared criminal; they were themſelves perſonally arreſted; orders were given for a new aſſembly to be called; and the king was requeſted to augment the naval and military force then at St Domingo.

The National Aſſembly of France having decreed that every perſon twenty-five years old and upwards, poſſeſſing property, or having reſided two years in the colony and paid taxes, ſhould be permitted to vote in the formation of the colonial aſſembly, the people of colour very naturally concluded that this privilege was conferred upon them. Such, however, we believe, was not the meaning of the National Aſſembly; but Gregoire, with the other friends of the negroes, at laſt prevailed, and mulattoes born of free parents were pronounced to be not only worthy of chooſing their repreſentatives, but alſo eligible themſelves to ſeats in the colonial aſſemblies. This decree ſacrificed at once all the whites in the iſland to the people of colour; and the indignation which filled the minds of both the royal and the republican parties ſeemed to have united them in one common cauſe. They reſolved to reject the civic oath; to confiſcate the French property in the harbour, on which they actually laid an embargo; to pull down the national colours, and to hoiſt the Britiſh ſtandard in their ſtead. The mulattoes in the mean time collected in armed bodies, and waited with anxious expectation to ſee what meaſures the colonial aſſembly would adopt.

During theſe diſſenſions, the negro ſlaves, into whoſe minds had been ſedulouſly inſtilled an opinion that their rights were equal to thoſe of their maſters, reſolved to recover their freedom. On the morning of the 23d of Auguſt 1791, the town of the Cape was alarmed by a confuſed report that the ſlaves in the adjoining pariſhes had revolted; and the tidings were ſoon confirmed by the arrival of thoſe who had narrowly eſcaped the maſſacre. The rebellion had broken out in the pariſh of Acul, nine miles from the city, where the whites had been butchered without diſtinction; and now the rebels proceeded from pariſh to pariſh, murdering the men, and raviſhing the unfortunate women who fell into their hands. In a ſhort time the ſword was accompanied with fire, and the cane-fields blazed in every direction. The citizens now flew to arms, and the command of the national troops was given to the governor, whilſt the women and children were put aboard the ſhips in the harbour for ſafety. In the firſt action the rebels were repulſed; but their numbers rapidly increaſing, the governor judged it expedient to act ſolely on the defenſive. In the ſpace of two months it was computed that upwards of 2000 white perſons periſhed; and of the inſurgents, who conſiſted as well of mulattoes as of negroes, not fewer than 10,000 died by famine and the ſword, and hundreds by the hands of the executioner.

When intelligence of theſe dreadful proceedings reached Paris, the Aſſembly began to be convinced that its equalizing principles had been carried too far; and the famous decree, which put the people of colour on the ſame footing with the whites, was repealed. Three commiſſioners were likewiſe ſent to the colony to reſtore peace between the whites and the mulattoes; but two of them being men of bad character, and none of them poſſeſſing abilities for the arduous taſk of extinguiſhing the flames of a civil war, they returned to France without accompliſhing in any degree the object of their miſſion.

In the mean time the *Amis des Noirs* in the mother country had once more gained the aſcendant in the National Aſſembly; and three new commiſſioners, Santhonax, Polverel, and Ailhaud, with 6000 choſen men from the national guards, were embarked for St Domingo. It was ſtrongly ſuſpected that the object of theſe commiſſioners was to procure unqualified freedom for all the blacks in the iſland; but they ſolemnly ſwore that their ſole purpoſe was to eſtabliſh the rights of the mulattoes, as decreed by the law which had been lately repealed. The whites therefore expected that a colonial aſſembly would be convoked; but inſtead of this the commiſſioners nominated twelve perſons, of whom ſix had been members of the laſt aſſembly, and ſix were mulattoes, *Une Commiſſion Intermediare*, with authority to raiſe contributions on the inhabitants, the application of which, however, they reſerved to themſelves. The governor finding that the commiſſioners uſurped all authority, complained that he was but a cypher in public affairs; his complaint was anſwered by an arreſt upon his perſon, and he was ſent a ſtate priſoner to France.

The tyranny of the commiſſioners did not ſtop here. They overawed the members of the commiſſion *intermediare*, by arreſting four of their number; and diſagreeing among themſelves, Santhonax and Polverel diſmiſſed miſled Ailhaud from their councils. War was by this time declared between the mother country and Great Britain, and prudence compelled the government of France to take ſome care of the injured colony. Galbaud, therefore, a man of fair character, was appointed governor, and ordered to put the iſland in a ſtate of defence againſt foreign invaſion; but poſſeſſing Weſt India property, which it ſeems was a legal diſqualification for the office of governor, the commiſſioners diſregarded his authority, and took up arms againſt him. Finding themſelves likely to be worſted, they offered to purchaſe the aid of the rebel negroes, by the offer of a pardon for their paſt conduct, freedom in future, and the plunder of the capital. Two of the negro chiefs, more honourable than the French commiſſioners, ſpurned at the baſe propoſal; but a third, after the governor had fled to the ſhips, entered the town with 3000 revolted negroes, and began an indiſcriminate maſſacre. The miſerable inhabitants fled to the ſhore, but their retreat was ſtopped by a party of mulattoes; and for two days the ſlaughter was inceſſant. The town was half conſumed by fire; and the commiſſioners, terrified at the work of their own hands, fled for protection to a ſhip of the line, and thence iſſued a manifeſto, which, while it tried to extenuate, evinced a conſciouſneſs of their guilt.

Thus was loſt perhaps to Europe, and loſt by the frantic conduct of French philanthropiſts, the fineſt iſland in the Weſt Indies; an iſland which produced alone as much ſugar as all the Britiſh Weſt India poſſeſſions united; not to mention the coffee and indigo, which were in immenſe quantities cultivated in Hiſpaniola. Had it not been for the reſtleſs machinations of the *Amis des Noirs*, it does not appear that ſo general a revolt would have taken place among the ſlaves; for though the ſpirit of republicaniſm had found its way into the iſland, the republicans joined with the royaliſts to keep the negroes in proper ſubjection. The unſucceſsful attempt which, at the requeſt of the more reſpectable part of the inhabitants, the Britiſh government made to ſubdue the execrable commiſſioners and their adherents, is freſh in the memory of all our readers, and need not here be detailed at length. Suffice it to ſay, that after prodigies of valour, our troops were compelled, rather by diſeaſe than by the ſwords of the enemy, to abandon the iſland, which is now under the controul of a negro or mulatto-chief. What will ultimately become of it, future events muſt decide; but let its protracted and bloody diſputes be a warning to all, and among others to our aſſociation for the abolition of the ſlave trade, that it is impoſſible to promote a good end by wicked means, and that ſlaves muſt be civilized before they be made free.

HITCHELAGA, or *Hochelaga*, an Indian village in Lower Canada, ſituated in the iſland of Montreal, and at the foot of the mountain ſo called. It is fortified after the Indian manner, and the inhabitants ſpeak the Huron language.—*Morſe.*

HITTON, a ſmall village in Anne Arundel county, Maryland, 13 miles W. by S. of Baltimore.—*ib.*

HIWASSEE is the only river of any conſequence which empties into the Tenneſſee from the ſouth. It is a bold river, paſſing through the Cherokee towns and empties into the Tenneſſee about 40 miles below the mouth of the Clinch, and 46 above the Whirl or Suck, by land, but 60 by water. It is navigable till it penetrates the mountains on its S. ſide. Ore was found in theſe mountains, when in poſſeſſion of the Britiſh, from which gold was extracted. The Indians know the ſpot; but are very anxious to keep it a ſecret. A branch of the Hiwaſſee, called Amoia, almoſt interlocks a branch of the Mobile. The portage between them is ſhort, and the road firm and level.—*ib.*

HOBOKEN, a tract of land in Bergen county, New-Jerſey, ſituated on the W. bank of the Hudſon, in the mountainous country between the town of Bergen and Fort Lee, about 7 miles above New-York city.—*ib.*

HOCKHOCKING, a river in the N. W. Territory, about 28 miles below the Muſkingum, which it reſembles, but is inferior to it in ſize. It riſes near a branch of the Sciota, and taking a S. W. courſe enters the Ohio at Bellpre, in N. lat. 38° 57′. It is navigable for large flat bottomed boats, between 70 and 80 miles; has fine meadows with high banks, which are ſeldom overflowed, and rich uplands on its borders. On the banks of this fine river are inexhauſtible quarries of free-ſtone, large beds of iron ore, rich mines of lead, and coal pits. There are alſo productive ſalt ſprings, beds of white and blue clay of an excellent quality. Red bole, and many other uſeful foſſils have been found on the banks of this river.—*ib.*

HOLDEN, a townſhip in Worceſter county, Maſſachuſetts, was formerly the north-weſtern part of Worceſter, from which it is diſtant 7 miles, and 51 miles W. of Boſton. It contains 1080 inhabitants. It was incorporated in 1740. In the earthquake in 1755, there were ſeveral acres of land, in an obſcure place in the N. E. corner of the townſhip, quite ſurrounded by a viſible fracture in the earth, of a circular form, and of various width and depth. The ſmall river there had its bed raiſed ſo as to occaſion a conſiderable fall of water, where there was little or none before. The ſtump of a tree, that ſtood directly over the chaſm, on the E. was divided into two equal parts, one ſtanding on the outſide of the chaſm, the other upon the inſide; but not oppoſite to each other: the half within the chaſm, being carried 5 feet forward, towards the river.—*ib.*

HOLDERNESS, a townſhip in Grafton county, New-Hampſhire, ſituated on the eaſtern ſide of Pemigewaſſet river, was incorporated in 1761, and contains 329 inhabitants. A corner of Squam Lake is in this townſhip; and Rattleſnake Mountain lies partly in this and Sandwich the adjoining townſhip on the N. E. It is 64 miles N. N. W. of Portſmouth.—*ib.*

HOLE-IN-THE-WALL, a village in Talbot county, Maryland, on the E. ſide of Cheſapeak bay; 7 miles eaſterly of Oxford, and a like diſtance S. of Eaſton.—*ib.*

HOLLAND, a townſhip in Hampſhire county, Maſſachuſetts, which, until incorporated in 1785, was the E. pariſh of South-Brimfield, and is bounded S. by Tolland county, in Connecticut, E. by Worceſter county, and northward by Brimfield. It contains 428 inhabitants, and is 75 miles S. W. by W. of Boſton.—*ib.*

HOLLAND *Company Lands*, are ſituated in Pennſylvania, on the navigable waters of Alleghany river and French Creek.—*ib.*

HOLLAND'S *Iſlands* are near to, and ſouth of Hooper's Iſland and Straits in Cheſapeak Bay.—*ib.*

HOLLAND'S *Point*, on the weſt ſide of Cheſapeak Bay, together with Parker's Iſland, form the mouth of Herring Bay.—*ib.*

HOLLIS, the *Niſitiſſet* of the Indians, a townſhip in Hillſborough county, New-Hampſhire, ſituated on the Maſſachuſetts line, incorporated in 1746, and contains 1441 inhabitants. It is about 70 miles S. W. of Portſmouth, and 45 N. W. of Boſton.—*ib.*

HOLLIDAYS *Iſland* lies 15 miles up Chowan river in North Carolina: Thus far the river is three miles wide.—*ib.*

HOLLISTON, the moſt ſouthern townſhip in Middleſex county, Maſſachuſetts, has Hopkinton on the north, Wrentham on the eaſt, and is 24 miles S. by W. of Boſton. The firſt ſettlements were made here in 1710, and in 1724 the town was incorporated by its preſent name in honour of Thomas Hollis of London, one of the patrons of Cambridge Univerſity; and it now contains 875 inhabitants.—*ib.*

HOLLOW, in architecture, a concave moulding, about a quarter of a circle, by ſome called a caſement, by others an abacus.

Hollow-Tower, in fortification, is a rounding made of the remainder of two briſures, to join the curtain to the crillon, where the ſmall ſhot are played, that they may not be ſo much expoſed to the view of the enemy.

HOLSTON, the largeſt branch of Tenneſſee river, riſes in Virginia, and joins that river 22 miles below Knoxville. It is a large, bold river, upwards of 300 yards wide at that town, is about 200 miles in length, and receives in its courſe ſeveral conſiderable rivers, viz. from its head downwards, Watauga, French Broad, (which includes Limeſtone Creek, Nolachucky, Swanano, Big Laurel, and Big and Little Pigeon) and Little rivers. The ſtreams on the northern ſide are creeks of no great ſize or length of courſe. Holſton is navigable for boats of 25 tons upwards of 100 miles, as high as the mouth of the North Fork; at which place Mr David Roſs has erected iron-works upon a large ſcale. At the mouth of this river, on the north ſide, ſtands Fort Grainger. The river is 150 yards wide, 16 miles above the North Fork at Roſs's iron-works, and nearly 5 above Long-Iſland, and in N. lat. 36° 27′, W. long. 83° 8′.—*Morſe.*

HOLSTON, a ſettlement on the river above mentioned, in the State of Tenneſſee, containing 28,649 inhabitants, though in the year 1775 it had hardly 2,200; yet its importance during the revolution may be conceived, when it is known that a great part of thoſe volunteer troops who attacked and defeated the Britiſh and tories on King's Mountain, who were commanded by Colonel Ferguſon, came from this country.

The land is generally fertile, but the face of the country is much broken. Placed between two large mountains, it ſeldom ſuffers for want of rain. It abounds with iron ore. A capital furnace and forge have lately been erected in Holſton near the Virginia line, a bloomery below the mouth of Watawga, and another 25 miles above the mouth of the French Broad. There are ſundry lead mines in the ſettlement, one in particular on the French Broad, that produces 75 per cent. pure lead. Long-Iſland on Holſton river is 340 miles S. W. by W. of Richmond in Virginia.—*ib.*

HOLWELL (John Zephaniah, Eſq;), was a gentleman of letters, whoſe hiſtory is well intitled to a place in ſuch a collection as ours; but, unfortunately, we know not either the time or the place of his birth, or the ſchool at which he was educated. At an early period of life he was ſent to Bengal as a writer in the Eaſt-India Company's ſervice, and in the year 1756, was ſecond in council at Fort William, when an offence was given to the nabob of Bengal by the governor's protecting a fugitive native. In revenge for this, the nabob marched againſt the fort with a powerful army. Drake, the chief who had given the offence, deſerted his ſtation, and the command devolved on Mr Holwell, who, with the few men he had, defended the place to the laſt extremity. This oppoſition incenſed the nabob againſt Mr Holwell; and although on the ſurrender he had given his word that no harm ſhould come to him, Mr Holwell and his unfortunate fellows in arms were thruſt into a cloſe priſon, called the Black Hole*, not eighteen feet ſquare, to the number of 146 perſons, and into which no ſupply of air could come but by two ſmall windows in one end. Here for one whole night they were confined; the numbers crowded together cauſed a moſt profuſe perſpiration, which was ſucceeded by a raging thirſt. They called for water, but the little ſupply which the humanity of the black ſoldiers could grant them, was nearly all loſt in the ſtruggle to obtain it. Every few minutes ſome one or other expired, through thirſt, or preſſure, or were trampled to death. Mr Holwell, after ſtruggling for many hours, threw himſelf down on a platform, and in a ſhort ſpace of time happily became inſenſible. In this diſmal dungeon they were kept till ſix o'clock in the morning, when twenty-three only were found alive. Mr Holwell himſelf was in a high fever, but was loaded with fetters and otherwiſe ill treated, yet the excellency of his conſtitution overcame all his hardſhips, and he was ſoon after releaſed and embarked for England. In 1758 he publiſhed a well written and affecting narrative of the ſufferings of himſelf and his companions. Since this time Mr Holwell has reſided in England, and has written ſeveral tracts on Indian affairs, particularly a work in three parts, intitled "Events relative to Bengal and Hindoſtan."—"The manner of inoculating for the ſmall-pox in the Eaſt Indies."—"A new experiment for the prevention of crimes," publiſhed in 1786. He has alſo publiſhed a tract which contains ſome very ſingular ſentiments on religious ſubjects, intitled "Diſſertations on the origin, nature, and purſuits of intelligent beings, and on Divine Providence, religion, and religious worſhip." Mr Holwell was elected many years ago, F. R. S. and lived to a good old age, reſpected by his acquaintance, and although much afflicted by bodily complaints, poſſeſſed a wonderful fund of ſpirits.

HOMER, a military townſhip in Onondaga county, New York, on the head waters of the N. W. branch of Chenengo river; 56 of its inhabitants are electors.—*ib.*

HOMODROMUS VECTIS, or *Lever*, in mechanics, is a lever in which the weight and power are both on the ſame ſide of the fulcrum as in the lever of the 2d and 3d kind; being ſo called, becauſe here the weight and power move both in the ſame direction, whereas in the heterodromus they move in oppoſite directions.

HONA CHITTO, a river which riſes in Georgia, in

* See CALCUTTA, *Encycl.*

in N. lat. 32°, between Pearl and Looſa Chitto rivers, runs ſoutherly 125 miles, and at the town of Manca in Weſt-Florida, a few miles from its mouth, runs W. to Miſſiſſippi river. N. lat. 30° 25′.—*ib.*

HONDO, RIO, a river of Yucatan, which empties into the bay of Honduras. This river, by the peace of 1783, was the northern boundary of the tract ſouthward of Balleſſe river, granted by the Spaniards to the Britiſh, to cut and carry away logwood.—*ib.*

HONDURAS, a province of New Spain, having the bay of its name and the North Sea on the north; Yucatan on the north-weſt; and the Moſquito Shore on the north-eaſt; Nicaragua and Guatimala on the ſouth, and Vera Paz on the weſt. It is about 100 leagues long and 80 broad. It abounds with honey, cotton, fine wool, dye woods in particular, and has ſome gold and ſilver mines. The rivers overflow like the Nile, and enrich the land. The air is good, except near the lagoons and low grounds. The ſoil in many parts bears Indian corn thrice a year; and the vineyards bear twice a year; for immediately after the vintage they cut them again; and the ſecond grapes are ripe before Chriſtmas. Valladolid is the chief town, where the governor and biſhop reſide. Truxillo is alſo a fine town, and very ſtrong by nature; and Omoah is ſtrongly fortified. The Spaniards claim this country; but the Engliſh have been long in poſſeſſion of the logwood tract in the Bay of Honduras, cutting large quantities of it every year. And the Moſquito Indians to the eaſt of this province have entered into treaties with the Engliſh, received them into their country, and done them ſeveral ſervices. Beſides, the Spaniards have no forts in this bay, or in the country of the Moſquitos, only two ſmall towns.—*ib.*

HONEYYOE, a lake in the Geneſſee country in New-York State, weſtward of Canandargua Lake, 5 miles long and 3 broad.—*ib.*

HONOMINIES, a river in the N. W. Territory which runs S. S. eaſterly into Puan Bay. Between the head of this river and Lake Superior is a ſhort portage.—*ib.*

HOOKE (Dr Robert) is ſaid, in the account of him which is publiſhed in the *Encyclopædia*, to have laid claim to the inventions of others, and to have boaſted of many of his own, which he never communicated. We will not preſume to ſay that this charge is entirely groundleſs; but we know that it has been greatly exaggerated, and that many diſcoveries undoubtedly made by him have been claimed by others. Of this the reader will find one conſpicuous proof under the article WATCH (*Encycl.*); and perhaps the following hiſtory of the inventions to which he laid claim may furniſh another. It would be harſh to charge him with falſity in any of them; that is to ſay, to imagine that he either ſtole them from others, or did not *think*, at leaſt, that he was *an* inventor. And, with reſpect to many of them, the priority of his claim is beyond diſpute.

1656, Barometer, a weather glaſs.

1657, A ſcapement, for maintaining the vibration of a pendulum.—And not long after, the regulating or balance-ſpring for watches.

1658, The double barrelled air pump.—The conical pendulum.—His firſt employment of the conical pendulum was no leſs ingenious and ſcientific than it was original. He employed it to repreſent the mutual gravitation of the planets; a fact which he had moſt ſyſtematically announced. He had ſhewn, that a force, perfectly analogous to gravity on this earth, operated on the ſurface of the moon and of Jupiter. Conſidering the numerous round pits on the ſurface of the moon, ſurrounded with a ſort of wall, and having a little eminence in the middle, as the production of volcanoes, he inferred, that the ejected matter fell back again to the moon, as ſuch matter falls back again to the earth. He ſaw Jupiter ſurrounded with an atmoſphere, which accompanied him; and therefore preſſed on him, as our air preſſes on the earth:—He inferred, that it was the ſame kind of power that maintained the ſun and other planets in a round form. He inferred a force to the ſun from the circulation round him, and he called it a *gravitation;* and ſaid that it was not the earth which deſcribed the ellipſe, but the centre of gravity of the earth and moon. He therefore made a conical pendulum, whoſe tendency to a vertical poſition repreſented the gravitation to the ſun, and which was projected at right angles to the vertical plane; and ſhewed experimentally, how the different proportions of the projectile and centripetal tendencies produced various degrees of eccentricity in the orbit. He then added another pendulum, deſcribing a cone round the firſt, while this deſcribed a cone round the vertical line, in order to ſee what point between them deſcribed the ellipſe. The reſults of the experiment were intricate and unſatisfactory; but the thought was ingenious. He candidly acknowledged, that he had not diſcovered the true law of gravitation which would produce the deſcription of an ellipſe *round the focus*, owing to his want of due mathematical knowledge; and therefore left this inveſtigation to his ſuperiors. Sir Iſaac Newton was the happy man who made the diſcovery, after having entertained the ſame notions of the forces which connected the bodies of the ſolar ſyſtem, before he had any acquaintance with Dr Hooke, or knew of his ſpeculations.

1660, The engine for cutting clock and watch wheels.—The chief phenomena of capillary attraction.—The freezing of water a fixed temperature.

1663, The method of ſupplying air to a diving bell.—The number of vibrations made by a muſical chord.

1664, His Micrographia was, by the council of the Royal Society, ordered to be printed; but in that work are many juſt notions reſpecting reſpiration, the compoſition of the atmoſphere, and the nature of light, which were afterwards attributed as diſcoveries to Mayow and others, who, though we are far from ſuppoſing that they ſtole their diſcoveries from Dr Hooke, were certainly anticipated by him.

1666, A quadrant by reflection.

1667, The marine barometer.—The gage for ſounding unfathomable depths.

1668, The meaſurement of a degree of the meridian, with a view to determine the figure of the earth, by means of a zenith ſector.

1669, The fact of the *conſervatio virium vivarum*, and that in all the productions and extinctions of motion, the accumulated forces were as the ſquares of the final or initial velocities. This doctrine he announces in all its generality and importance, deducing from it all the conſequences which John Bernoulli values himſelf ſo highly upon, and which are the chief facts adduced by Leibnitz in ſupport of his doctrine of the forces of bodies in motion. But Hooke was perfectly aware of their entire correſpondence with the Carteſian, or common doctrine, and was one of the firſt in applying the celebrated 39th propoſition of Newton's Principia to his former poſitions on this ſubject, as a mathematical demonſtration of them.

1673, That the catenarea was the beſt form of an arch.

1674, Steam engine on Newcomen's principle.

1679, That the air was the ſole ſource of heat in burning: That combuſtion is the ſolution of the inflammable vapour in air; and that in this ſolution the air gives out its heat and light. That nitre explodes and cauſes bodies to burn without air, becauſe it conſiſts of this air, accompanied by its heat and light in a condenſed or ſolid ſtate; and air ſupports flame, becauſe it contains the ſame ingredients that gunpowder doth, that is, a nitrous ſpirit: That this air diſſolves ſomething in the blood while it is expoſed to it in the lungs in a very expanded ſurface, and when ſaturated with it, can no longer ſupport life nor flame; but in the act of ſolution, it produces animal heat: That the arterial and venal blood differ on account of this ſomething being wanting in one of them. In ſhort, the fundamental doctrines of modern chemiſtry are ſyſtematically delivered by Dr Hooke in his Micrographia, publiſhed in 1664, and his Lampas, publiſhed in 1677.

1680, He firſt obſerved the ſecondary vibrations of elaſtic bodies, and their connection with harmonic ſounds. A glaſs containing water, and excited by a fiddleſtick, threw the water into undulations, which were ſquare, hexagonal, octagonal, &c. ſhewing that it made vibrations ſubordinate to the total vibration; and that the fundamental ſound was accompanied by its octave, its twelfth, &c.

1681, He exhibited muſical tones by means of toothed wheels, whirled round and rubbed with a quill, which dropped from tooth to tooth, and produced tones proportioned to the frequency of the cracks or ſnaps.

1684, He read a paper before the Royal Society, in which he affirms, that ſome years before that period he had propoſed a method of diſcourſing at a diſtance, not by ſound, but by ſight. He then proceeds to deſcribe a very accurate and complete telegraph, equal, perhaps, in all reſpects to thoſe now in uſe. But ſome years previous to 1684, M. Amontans had not invented his telegraph; ſo that, though the Marquis of Worceſter unqueſtionably gave the firſt hint of this inſtrument, Dr Hooke appears to have firſt brought it to perfection. See Telegraph, *Encycl.*; and a book, publiſhed 1726, entitled *Philoſophical Experiments and Obſervations* of the late eminent Dr Robert Hooke.

We are indebted to him for many other diſcoveries of leſſer note; ſuch as the wheel barometer, the univerſal joint, the manometer, ſcrew divided quadrant, teleſcopic ſights for aſtronomical inſtruments, repreſentation of a muſcular fibre by a chain of bladders, experiments ſhewing the inflection of light, and its attraction for ſolid bodies, the curvilineal path of light through the atmoſphere.

HOOKSET FALLS, or *Hookſet Iſle Falls* in Merrimack river, juſt below the mouth of Suncook, 7 miles above Amuſkeag Falls, and 8 miles below Concord, in New-Hampſhire.—*Morse.*

HOOKSTOWN, a village on the weſt ſide of Cheſapeak Bay in Maryland, in Baltimore county, 6 miles N. W. of the town of Baltimore.—*ib.*

HOOKTOWN, a village on the eaſt ſide of Cheſapeak Bay, in Talbot county, Maryland, lies north of Eaſton, and S. W. of Williamſburg, nearly 3 miles from each.—*ib.*

HOOPER'S ISLAND and STRAITS lie on the eaſt ſide of Cheſapeak Bay, and on the S. W. coaſt of Dorcheſter county, Maryland. The iſland is 7 miles long, and 2½ broad.—*ib.*

HOOSACK, a river of New-York which falls into the Hudſon from the eaſt, about 8 miles above the city of Lanſinburgh. It riſes in Berkſhire county, Maſſachuſetts, runs north-weſterly through Pownal in Vermont, thence into New-York State. Its length is about 40 miles. The curious mill-ſtream called Hudſon's Brook, which falls into a north branch of Hooſack, is deſcribed in the article *Adams*, in this *Supplement.*—*ib.*

HOPE, a village in Suſſex county, New-Jerſey, on the poſt-road from Newtown to Eaſton in Pennſylvania, 16 miles S. W. of the former, and 20 N. E. of the latter. It is inhabited by about 100 of the Moravian United Brethren.—*ib.*

Hope, a bay on the N. W. coaſt of N. America, ſo named by Capt. Cook. The entrance of Nootka, or St George's Sound, is ſituated in the eaſt corner of Hope Bay, in N. lat. 49° 33′, E. long. 233° 12′.—*ib.*

Hope, a Moravian ſettlement in Wachovia, in N. Carolina, in Surry county, where is a meeting-houſe of the United Brethren.—*ib.*

Hope, a ſmall iſland in Narraganſet Bay, State of Rhode-Iſland.—*ib.*

HOPEWELL, a townſhip in Cumberland county, in the province of New-Brunſwick, ſituated on Chepodie river, which runs eaſterly into a northern arm of the Bay of Fundy, and is navigable 4 or 5 miles.—*ib.*

Hopewell, the name of 3 townſhips in Pennſylvania, viz. in York, Huntingdon, and Waſhington counties.—*ib.*

Hopewell, a townſhip in Hunterdon county, New-Jerſey, ſituated on Delaware river, 14 miles W. of Princeton, 11 above Trenton and 30 ſouth-weſterly of New-Brunſwick. It contains 2320 inhabitants, including 233 ſlaves. Another townſhip of this name lies in Cumberland county, in New-Jerſey.—*ib.*

HOPKINS, or *Hopkinſville*, a townſhip in Caledonia county, in Vermont, was granted to Dr Hopkins; 11 miles northweſt of the upper bar of the Fifteen Mile Falls in Connecticut river.—*ib.*

HOPKINSON (Francis, Eſq.) Judge of the Court of Admiralty in Pennſylvania, poſſeſſed an uncommon ſhare of genius of a peculiar kind. He excelled in muſic and poetry, (A) and had ſome knowledge

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(A) He invented an improved tongue for the harpſichord; a deſcription of which accompanied with an engraving, may be ſeen in the Columbian Magazine for May 1787. He alſo publiſhed a ſmall collection of ſongs, compoſed and ſet to muſick by himſelf, which have been univerſally admired.

ledge in painting. But theſe arts did not monopoliſe all the powers of his mind. He was well ſkilled in many practical and uſeful ſciences, particularly mathematics and natural philoſophy, and he had a general acquaintance with the principles of anatomy, chemiſtry, and natural hiſtory.—But his *forte* was *humour* and *ſatire*, in both of which he was not ſurpaſſed by Lucian, Swift, or Rabelais. Theſe extraordinary powers were conſecrated to the advancement of the intereſts of patriotiſm, virtue, and ſcience. It would fill many pages to mention his numerous publications during the late revolution, all of which were directed to thoſe important objects.——He began in the year 1775, with a ſmall tract which he entitled "A pretty ſtory" in which he expoſed the tyranny of Great Britain in America, by a moſt beautiful allegory, and he concluded his contributions to his country, in this way, with the hiſtory of "a new roof." A performance, which for wit, humour, and good ſenſe, muſt laſt as long as the citizens of America continue to admire, and to be happy under, the preſent national government of the United States.

Newſpaper ſcandal, frequently for months together, diſappeared or languiſhed, after the publication of ſeveral of his irreſiſtible ſatires upon that diſgraceful ſpecies of writing. He gave a currency to a *thought* or *phraſe* in theſe effuſions from his pen, which never failed to bear down the ſpirit of the times, and frequently to turn the divided tides of party-rage, into one general channel of ridicule or contempt.

Sometimes he employed his formidable powers of humour and ſatire in expoſing the formalities of technical ſcience.—He thought much, and thought juſtly, upon the ſubject of education. He often ridiculed in converſation, the practice of teaching children the Engliſh language by means of grammar. He conſidered moſt of the years which are ſpent in learning the Latin and Greek languages as loſt, and he held ſeveral of the arts and ſciences which are ſtill taught in our colleges, in great contempt. His ſpecimen of modern learning, in a tedious examination, the only object of which was to deſcribe the properties of a "ſalt-box," publiſhed in the American Muſeum for February 1787, will always be reliſhed as a morſel of exquiſite humour, while the preſent abſurd modes of education continue to be practiſed in the United States.

Mr Hopkinſon poſſeſſed uncommon talents for pleaſing in company. His wit was not of that coarſe kind which was calculated to "ſet the table in a roar." It was mild and elegant, and infuſed cheerfulneſs, and a ſpecies of delicate joy, rather than mirth, into the hearts of all who heard it. His empire over the attention and paſſions of his company was not purchaſed at the expenſe of innocence. A perſon who has paſſed many delightful hours in his ſociety, declares with pleaſure, that he never once heard him uſe a profane expreſſion, nor utter a word that would have made a lady bluſh, or have clouded her countenance for a moment with a look of diſapprobation. It is this ſpecies of wit alone that indicates a rich and powerful imagination, while that which is tinctured with profanity, or indelicacy, argues poverty of genius, inaſmuch as they have both been conſidered very properly, as the cheapeſt products of the mind.

Mr Hopkinſon's character for abilities and patriotiſm procured him the confidence of his countrymen in the moſt trying exigencies of their affairs. He repreſented the ſtate of New-Jerſey, in Congreſs, in the year 1776, and ſubſcribed the ever-memorable declaration of independence. He held an appointment in the loan-office for ſeveral years, and afterwards ſucceeded George Roſs, Eſq. as judge of the admiralty for the ſtate of Pennſylvania. In this ſtation he continued till the year 1790, when he was appointed judge of the diſtrict court in Pennſylvania, by the Preſident of the United States. In each of theſe judicial offices, he conducted himſelf with integrity. His education qualified him for their duties, for he had been regularly bred to the law, under Benjamin Chew, Eſq. when attorney general of Pennſylvania.

He was an active and uſeful member of three great parties which at different times divided his native ſtate —he was a *whig*, a *republican*, and a *federaliſt*, and he lived to ſee the principles and wiſhes of each of thoſe parties finally and univerſally ſucceſsful. Although his labours had been rewarded with many plentiful harveſts of well-earned fame, yet his death, to his country and his friends, was premature. He had been ſubject to frequent attacks of the gout in his head, but for ſome time before his death, he had enjoyed a conſiderable reſpite from them. On Sunday evening, May the 8th, 1791 he was ſomewhat indiſpoſed, and paſſed a reſtleſs night after he went to bed. He roſe on Monday morning at his uſual hour, and breakfaſted with his family.—At ſeven o'clock he was ſeized with an apoplectic fit, which in two hours put a period to his exiſtence, in the 53d year of his age.

His perſon was a little below the common ſize. His features were ſmall, but extremely animated. His ſpeech was quick, and all his motions ſeemed to partake of the unceaſing activity and verſatility of the powers of his mind.

It only remains to add to this account of Mr Hopkinſon, that the various cauſes which contributed to the eſtabliſhment of the independence and federal government of the United States, will not be *fully traced*, unleſs much is aſcribed to the irreſiſtible influence of the *ridicule* which he poured forth, from time to time, upon the enemies of thoſe great political events.

HOPKINTON, a townſhip in Hillſborough county, New-Hampſhire, on Contoocook river, 9 miles S. W. from its confluence with the Merrimack, and divided from Concord on the eaſt, by the Rockingham county line. It was firſt granted by Maſſachuſetts, was incorporated in 1765, and contains 1,715 inhabitants, who are chiefly farmers. It is 42 miles E. by S. of Charleſtown on Connecticut river, and about 58 W. by N. of Portſmouth.—*Morſe.*

Hopkinton, a townſhip in Middleſex county, Maſſachuſetts. It was incorporated in 1715, and contains 1317 inhabitants. The rivers Concord, Providence and Charles receive each of them a branch from this town: Theſe ſtreams furniſh ſeats for 7 or 8 griſt-mills, a number of ſaw-mills, iron-works, &c.—*ib.*

Hopkinton, a townſhip in Waſhington county, Rhode-Iſland, ſituated on the weſt line of the State, on ſeveral branches of Pawcatuck river. It contains 2462 inhabitants, including 7 ſlaves.—*ib.*

HORNE (George, D. D.), late Lord Biſhop of Norwich, was a man of ſuch amiable diſpoſitions, primitive piety, and exemplary morals, that we wiſh it were in our power to do juſtice to his character. His life, it is true, has been already written, at conſiderable length, by two authors, poſſeſſed of erudition and of unqueſtionable integrity; but mere erudition is by no means ſufficient to fit a man for diſcharging the duties of a biographer. It was not the learning of Johnſon, but his ſagacity, and intimate acquaintance with human nature, that placed him ſo far above his contemporaries in this department of literature.

Of Biſhop Horne's biographers, one poſſeſſed, indeed, the great advantage of having lived in habits of intimacy with him from his boyiſh years. In the authenticity of his narrative, therefore, the fulleſt confidence may be placed: and that narrative we ſhall faithfully follow; reſerving, however, to ourſelves the liberty of ſometimes making reflections on the various incidents recorded, widely different from thoſe of the author.

George Horne was, in 1730, born at Otham in Kent, a village near Maidſtone, giving the name to a pariſh, of which his father was the rector. He was the ſecond of four ſons; of whom the eldeſt died in very early life, and the youngeſt, who is ſtill alive, ſucceeded his father both in the rectory of Otham and in that of Breda in the county of Suſſex. He had likewiſe three ſiſters, of whoſe fortunes we know nothing.

Mr Horne, the father of the family, was of a temper ſo remarkably averſe from giving pain or trouble upon any occaſion, that he uſed to awake his ſon George, when an infant, by playing upon a flute, that the change from ſleeping to awaking might be gradual and pleaſant. Having been for ſome years a tutor at Oxford, he took upon himſelf the early part of the claſſical education of his favourite ſon; an office of which he was well qualified to diſcharge the duties. Under ſuch an inſtructor, the ſubject of this memoir led a very pleaſant life, and made a rapid progreſs in the Greek and Latin languages. By the perſuaſion of a friend, however, he was, at the age of thirteen, placed in the ſchool of Maidſtone, then under the care of a Mr Bye, eminent for his knowledge of ancient literature. And remaining with this gentleman two years, he added much to his ſtock of learning; and, among other things, a little elementary knowledge of the Hebrew tongue, which Mr Bye taught on the plan of Buxtorf. Though Dr Horne afterwards rejected that plan, he readily admitted, that the knowledge of it was of great advantage to him.

At the age of fifteen, he was removed from Maidſtone ſchool to Univerſity college Oxford, where his father had happily obtained for him a ſcholarſhip. At college his ſtudies were, in general, the ſame with thoſe of other virtuous and ingenious youths; while the vivacity of his converſation, and the propriety of his conduct, endeared him to all whoſe regard was creditable. About the time of his taking his batchelor's degree, he was choſen a fellow of Magdalen College; and ſoon afterwards, if not before, commenced author.

The hiſtory of his authorſhip is curious, and we ſhall give it at ſome length. While he was deeply engaged in the ſtudy of oratory, poetry, and every branch of polite literature, he was initiated by his faithful friend Mr Jones in the myſteries of Hutchinſonianiſm; but Mr Jones was not his preceptor. Indeed that gentleman informs us, that when he firſt communicated to Mr Horne the novelties with which his own mind was filled, he found his friend very little inclined to conſider them; and had the mortification to ſee, that he was himſelf loſing ground in Mr Horne's eſteem, even for making the attempt to convert him. At this we are not to be much ſurpriſed. Mr Horne, though, by his biographer's account, no deep Newtonian, ſaw, or thought he ſaw, the neceſſity of a *vacuum* to the poſſibility of *motion*; and as we believe that every man, who knows the meaning of the words *motion* and *vacuum*, and whoſe mind is not biaſſed in favour of a ſyſtem, ſees the ſame thing, it was not to be ſuppoſed, that a youth of ſound judgment would haſtily relinquiſh ſo natural a notion. By Mr Horne, however, it was at length relinquiſhed. Mr Jones introduced him to Mr George Watſon, a fellow of Univerſity college, whom he repreſents as a man of very ſuperior accompliſhments; and by Mr Watſon Mr Horne was made a Hutchinſonian of ſuch zeal, that at the age of nineteen he implicitly adopted the wild opinion of the author of that ſyſtem, that Newton and Clarke had formed the deſign of bringing the Heathen *Jupiter*, or Stoical *anima mundi*, into the place of the God of the univerſe. With ſuch a conviction impreſſed upon his mind, it is not wonderful that he ſhould endeavour to diſcredit the ſyſtem of Newton. This he attempted, by publiſhing a parallel between that ſyſtem and the Heathen doctrines in the *Somnium Scipionis* of Cicero. That publication which was anonymous, we have never ſeen; but Mr Jones himſelf admits it to have been exceptionable; and the amiable author ſeems to have been of the ſame opinion, for he never republiſhed it, nor, we believe, replied to the anſwers which it provoked.

He did not, however, deſert the cauſe, but publiſhed, ſoon afterwards, a mild and ſerious pamphlet, which he called *A Fair, Candid, and Impartial State of the Caſe between Sir Iſaac Newton and Mr Hutchinſon*. Even of this pamphlet we have not been able to procure a ſight; but Mr Jones aſſures us, that the author allows to Sir Iſaac the great merit of having ſettled laws and rules in natural philoſophy, and of having meaſured *forces* as a mathematician with ſovereign ſkill; whilſt he claims for Mr Hutchinſon the diſcovery of the true phyſiological cauſes, by which, under the power of the Creator, the natural world is moved and directed.

If this be a fair view of *the ſtate of the caſe*, it allows to Newton more than ever Newton claimed, or has been claimed for him by his fondeſt admirers; for the laws and rules, which he ſo faithfully followed in the ſtudy of philoſophy, were not ſettled by him, but by the illuſtrious Bacon. With reſpect to the *true* cauſes here mentioned, we have repeatedly had occaſion, during the courſe of this Work, to declare our opinion, that all men are equally ignorant of them, if they be conſidered as any thing diſtinct from the general *laws* by which the operations of nature are carried on. To the diſcovery of other phyſiological cauſes, Newton, in his greateſt work, made indeed no pretenſion; but it may be worth while, and can hardly be conſidered as a digreſſion, to conſider what are the pretenſions of Hutchinſon, to which Meſſrs Horne and Jones gave ſo decided a preference.

Mr Hutchinſon himſelf writes ſo obſcurely, that we dare not venture to tranſlate his language into common Engliſh, leſt we ſhould undeſignedly miſrepreſent his meaning; but according to Mr Jones, who has ſtudied his works with care, his diſtinguiſhing doctrine in philoſophy is, that "The forces, of which the Newtonians treat, are not the forces of nature; but that the world is carried on by the action of the elements on one another, and all under God." What is here meant by the elements, we are taught by another eminent diſciple of that ſchool. "The great agents in nature, which carry on all its operations, are certainly (ſays Mr Parkhurſt) the *fluid* of the heavens; or, in other words, the fire at the orb of the ſun, the light iſſuing from it, and the ſpirit or groſs air conſtantly ſupporting, and concurring to the actions of the other two." (See CHERUBIM in this *Supplement*). Mr Horne adopted this ſyſtem in preference to the Newtonian; becauſe, ſays his biographer, "It appeared to him nothing better than raving, to give active powers to matter, ſuppoſing it capable of acting where it is not; and to affirm, at the ſame time, that all matter is inert, that is, inactive; and that the *Deity* cannot act but where he is *preſent*, becauſe his *power* cannot be but where his *ſubſtance* is."

That much impious arrogance has been betrayed, not by Newtonians only, but by philoſophers of every ſchool, when treating of the *modus operandi* of the Deity, we feel not ourſelves inclined to controvert; but we never knew a well-informed Newtonian, who ſpoke of the active powers of matter but in a metaphorical ſenſe; and ſuch language is uſed, and muſt be uſed, by the followers of Hutchinſon. Mr Jones ſpeaks of the *action* of the elements; and Mr Parkhurſt calls the fluid of the heavens, which, according to him, conſiſts of fire, light, and air, *agents*; but it would ſurely be uncandid to accuſe theſe two pious men of *animating* the elements, though we know that *action* and *activity*, in the literal ſenſe of the words, can be predicated only of living beings. With reſpect to giving active powers to matter, therefore, the followers of Hutchinſon rave juſt as much as thoſe of Newton; and we ſee not the raving of either in any other light than as the neceſſary conſequence of the poverty of language.

But the Newtonian makes matter act upon matter at a diſtance! No; the genuine Newtonian does not make matter *act* (in the proper ſenſe of the word) at all; but he believes, that God has ſo conſtituted matter, that the motions of different maſſes of it are affected by each other at a diſtance: and the Hutchinſonian holds the very ſame thing. As this celeſtial fluid of Mr Parkhurſt's conſiſts partly of air, we know, by the teſt of experiment, that it is elaſtic. The particles of which it is compoſed are therefore diſtant from each other; and yet they reſiſt compreſſion. How does the Hutchinſonian account for this fact? Perhaps he will ſay, that as matter is in itſelf equally indifferent to motion and reſt, God has ſo conſtituted the particles of this fluid, that though they poſſeſs no innate power or activity of their own, they are affected by each other at a diſtance, in conſequence of his fiat at the creation. This we believe to be the only ſolution of the difficulty which can be given by man; but it is the very anſwer given by the Newtonians to thoſe who object to them the abſurdity of ſuppoſing matter to be affected by matter at a diſtance. That the motions of the heavenly bodies are affected by the preſence of each other is a fact, ſay they, which appears incontrovertible. "We have aſcertained with preciſion the laws by which theſe motions are regulated: and without troubling ourſelves with the true phyſiological cauſes, have demonſtrated the agreement of the phenomena with the laws. The interpoſition of this celeſtial fluid removes not a ſingle difficulty with which our doctrine is ſuppoſed to be clogged. To have recourſe to it can therefore ſerve no purpoſe, even were the phenomena conſiſtent with the nature of an elaſtic fluid conſidered as a phyſical cauſe; but this is not the caſe. It is demonſtrable (ſee ASTRONOMY and DYNAMICS in this *Suppl.*), that the motions of the heavenly bodies are not conſiſtent with the mechaniſm of an elaſtic fluid, conſidered as the cauſe of theſe motions; and therefore, whether there be ſuch a fluid or not diffuſed through the ſolar ſyſtem, we cannot allow that it is the great agent in nature by which all its operations are carried on."

Such might be the reaſoning of a well-informed Newtonian in this controverſy; and it appears ſo concluſive againſt the objections of Hutchinſon to the Newtonian forces, as well as againſt the agents which he has ſubſtituted in their ſtead, that ſome of our readers may be diſpoſed to call in queſtion the ſoundneſs of that man's underſtanding who could become a Hutchinſonian ſo zealous as Mr Horne. But to theſe gentlemen we beg leave to reply, that the ſoundeſt and moſt upright mind is not proof againſt the influence of a ſyſtem, eſpecially if that ſyſtem has novelty to recommend it, and at the ſame time conſiſts of parts, of which, when taken ſeparately, many are valuable. Such was the ſyſtem of Hutchinſon when adopted by Mr Horne. It was then but very little known; it could be ſtudied only through the medium of Hebrew literature, not generally cultivated; and that literature, to the cultivation of which Mr Hutchinſon had given a new and a better turn, is in itſelf of the utmoſt importance. Let it be obſerved, too, that the Hutchinſonians have, for the moſt part, been men of devout minds, zealous in the cauſe of Chriſtianity, and untainted by a variety of extravagant hereſies which have ſo often divided the church of Chriſt:—and when all theſe circumſtances are taken into conſideration, it will not be deemed a proof of any defect in Mr Horne's underſtanding, that in early life he adopted the *whole* of a ſyſtem, of which ſome of the parts contain ſo much that is good; eſpecially when it is remembered, that at *firſt view* the agency of the celeſtial fluid appears ſo plauſible, that for a time it ſeems to have impoſed upon the mind of Newton himſelf.

But the truth is, that Mr Horne was at no period of his life a thorough paced Hutchinſonian. It is confeſſed by Mr Jones, that "Mr Hutchinſon and his admirers laid too great a ſtreſs on the evidence of Hebrew etymology; and that ſome of them carried the matter ſo far as to adopt a mode of ſpeaking, which had a nearer reſemblance to cant and jargon than to ſound ſenſe and ſober learning. Of this (continues he) Mr Horne was very ſoon aware; and he was in ſo little danger of following the example, that he uſed to diſplay the foibles of ſuch perſons with that mirth and good humour," which he poſſeſſed in a more exquiſite degree than moſt men. This ſeems to be complete evidence that he was never a friend to the etymologi-

Horne.

cal part of the ſyſtem; and the preſent writer can atteſt, that, in the year 1786, he ſeemed by his converſation to have loſt much of his conviction of the agency of the celeſtial fluid. He continued, indeed, to ſtudy the Hebrew Scriptures on the plan of Mr Hutchinſon, unincumbered with the Maſoretic points, or with rabbinical interpretations; and the fruits of his ſtudies are in the hands of the religious public, in works which, by *that* public, will be eſteemed as long as their language is underſtood.

Hitherto Mr Horne was a layman, but he intereſted himſelf in every thing connected with religion, as much as the moſt zealous dignitary of the church; and conſidering the *naturalization* of the Jews as a meaſure at leaſt indecent in a Chriſtian country, he publiſhed, in an evening paper, a ſeries of letters on that ſubject, both when the Jew-bill was depending, and after it had paſſed the houſe. The letters were anonymous; but they attracted much notice, and many groundleſs conjectures were made reſpecting their author. To the real author, the meaſure which they oppoſed was ſo very obnoxious, that he refuſed to dine at the table of a friend, only becauſe the ſon-in-law of Mr Pelham was to be there. And he was not much more friendly to the marriage-act than to the Jew-bill. If he conſidered the one as diſgraceful to religion, he probably thought that the other, with its numerous clauſes, might be made a ſnare for virtue.

The time now approached when he was to take holy orders, which to him was a very ſerious affair; and when he gave an account of his ordination to an intimate friend, he concluded the letter with the following reflections, which, even in an abſtract like this, it would be unpardonable to omit:

"May he, who ordered Peter three times to *feed his lambs*, give me grace, knowledge, and ſkill, to watch and attend to the flock which he purchaſed upon the croſs, and to give reſt to thoſe who are under the burden of ſin and ſorrow. It hath pleaſed God to call me to the miniſtry in very troubleſome times indeed, when a lion and a bear have broken into the fold, and are making havoc among the ſheep. With a firm, though humble confidence, do I purpoſe to go forth; not in my own ſtrength, but in the ſtrength of the Lord God; and may he proſper the work of my hands!" This was in the year 1753, when the pious author was hardly 23 years of age; and he had not been many months in orders, when one of the moſt celebrated preachers in the metropolis pronounced, that "George Horne was, without exception, the beſt preacher in England."

In the year 1756, he was again involved in controverſy. A pamphlet had been publiſhed at Oxford, ſuppoſed by Mr Kennicott, who afterwards gained ſuch fame as a collator of Hebrew manuſcripts, entitled *A Word to the Hutchinſonians*, in which Mr Horne was perſonally ſtruck at. To this work our author replied in a ſmall tract, called *An Apology for certain Gentlemen in the Univerſity of Oxford, Aſperſed in a late Anonymous Pamphlet*; and whatever may be thought of the queſtion at iſſue, all men muſt admire the temper with which the apologiſt conducted himſelf under very great provocation.

But it was not about Hutchinſonianiſm alone that theſe two illuſtrious men were doomed to differ. Mr Horne took a decided part againſt Mr Kennicott's propoſal for collating the text of the Hebrew bible, with ſuch manuſcripts as could be found, for the purpoſe of *reforming the text*, and preparing it for a new tranſlation into the Engliſh language; and in the year 1760, he publiſhed *A View of Mr Kennicott's Method of Correcting the Hebrew Text, with three Queries formed thereon, and humbly ſubmitted to the Chriſtian world.* That his alarm was on this occaſion too great, experience has ſhewn; but that it was not groundleſs, is evident from the *View*, in which the reader will find above 20 inſtances from Mr Kennicott's diſſertations (ſee KENNICOTT, *Encycl.*), to ſhew what an inundation of licentious criticiſm was breaking in upon the ſacred text. Indeed there is reaſon to believe, that this tract, together with another on the ſame ſide of the queſtion by Dr Rutherforth of Cambridge, contributed to repreſs the collator's raſhneſs, and to make the Bible of Dr Kennicott the valuable work which we find it. Be this as it may, ſuch was the moderation of the Drs Kennicott and Horne, that though their acquaintance commenced in hoſtility, they at length contracted for each other a friendſhip, which laſted to the end of their lives, and ſtill ſubſiſts between their families.

In what year Mr Horne was admitted to the degree of D. D. and when he was choſen preſident of his college, Mr Jones has not informed us; but, if our memory does not deceive us, he had obtained both theſe preferments when, in the year 1772, he gave to the public a ſmall work, 8vo, intitled *Conſiderations on the Life and Death of St John the Baptiſt.* This tract was the ſubſtance of a courſe of ſermons, which he had many years before, in conformity to an eſtabliſhed cuſtom at Magdalen College, preached before the univerſity of Oxford. Mr Jones, ſpeaking of it, ſays, that "he is perſuaded, there was no other man of his time, whoſe fancy as a writer was bright enough, whoſe ſkill as an interpreter was deep enough, and whoſe heart as a moraliſt was *pure* enough, to have made him the author of that little work." By moſt readers this ſtrain of panegyric will be thought extravagant, and of courſe it will defeat its own purpoſe; but the work is certainly a work of merit.

In the year 1776, when the author was vice-chancellor, was publiſhed, in two volumes 4to, Dr Horne's Commentary on the Pſalms. It is a work of which very different opinions have been formed, though it was the reſult of the labour of twenty years. That it will always be a favourite companion of the devout Chriſtian, we are as much inclined to believe as Mr Jones; but we cannot, without belying our own judgment, ſay that it appears to us calculated to produce much general good in an age like the preſent. Granting it to be true, which we believe will not be granted without ſome exceptions, that Clarke, and Hoadley, and Hare, and Middleton, and Warburton, and SHERLOCK, and SOUTH, and WILLIAM LAW, and Edmund Law, had turned the public attention, of which they had got the entire command, too much to the *letter* of the bible to the neglect of the *ſpirit* of it; ſhould not Dr Horne, after the example of St Paul, have let in the light gradually upon ſuch weak organs as thoſe of the public thus diſeaſed, rather than pour it upon them at once in a flood of ſplendor. The apoſtle "fed his Corinthian converts with milk and not with meat," when he found them unable to bear the latter food; and there is reaſon to ſuſpect that the carnal followers of Warburton, and Sherlock, and South, were unable to bear, at once, ſuch ſtrong meat, as that which makes the fifteenth pſalm a portrait of our Saviour. Indeed, we think it not improbable that the mind of Sherlock would have recoiled with horror from the very conception of the *poſſibility* of Jeſus Chriſt "ſwearing to his neighbour and diſappointing him," though that conception muſt have paſſed through a mind which was certainly as pure as his. The commentary, however, though truth thus compels us to ſay that, in our opinion, it is far from perfect, is certainly a work of great learning, great genius, and fervent piety, and ſuch as the devout Chriſtian will peruſe again and again with much advantage.

Dr Horne's next work was of a different kind, and, we think, of a ſuperior order. In the year 1776 was publiſhed a letter of Dr Adam Smith's, giving an account of the death of Mr David Hume. The object of the author was to ſhew that Mr Hume, notwithſtanding his ſceptical principles, had died with the utmoſt compoſure, and that in his life as well as at his death he had conducted himſelf as became one of the wiſeſt and beſt men that ever exiſted. The letter is very much laboured, and yet does no honour either to the author or his friend. It could not repreſent Mr Hume as ſupporting himſelf under the gradual decay of Nature with the hopes of a happy immortality; but it might have repreſented him as taking refuge, with other infidels, in the eternal ſleep of death. This, though but a gloomy proſpect, would not have been childiſh; but the hero of the tale is exhibited as talking like a ſchool boy of his conferences with Charon, and his reluctance to go into the Stygian ferry-boat, and conſoling himſelf with the thought of leaving all his friends, and his brother's family in particular, in great proſperity!!! The abſurdities of this letter did not eſcape the watchful and penetrating eye of Dr Horne; and as he could not miſtake its object, he held it up to the contempt and ſcorn of the religious world in *A Letter to Adam Smith, L. L. D. on the Life, Death and Philoſophy of his Friend David Hume, Eſq; by one of the People called Chriſtians*. The reaſoning of this little tract is clear and concluſive, while its keen, though good humoured wit is inimitable; and it was, ſome years afterwards, followed by a ſeries of *Letters on Infidelity*, compoſed on the ſame plan, and with much of the ſame ſpirit. This ſmall volume, to the ſecond edition of which the letter to Dr Smith was prefixed, is better calculated, than almoſt any other with which we are acquainted, to guard the minds of youth againſt the inſidious ſtrokes of infidel ridicule, the only dangerous weapon which infidelity has to wield.

When the letters on infidelity were publiſhed, their author had for ſome time been Dean of Canterbury, where he was beloved by the chapter and almoſt adored by the citizens. He was a very frequent preacher in the cathedral and metropolitical church, where the writer of this ſhort ſketch has liſtened to him with delight, and ſeen thouſands of people of very various deſcriptions hang with rapture on his lips. As a preacher indeed he excelled; and notwithſtanding the ſhortneſs of his ſight, which deprived him of ſome of the graces of a pulpit orator, ſuch were the excellence of his matter, the ſimple elegance of his ſtyle, and the ſweetneſs of his voice, that, when at the primary viſitation of the preſent archbiſhop, he preached his admirable ſermon *on the Duty of Contending for the Faith*, the attention of more than 2000 people was ſo completely fixed, that the ſmalleſt noiſe was not to be heard through the whole crowded choir. Of the importance of preaching, and of the proper mode of performing that duty, he had very juſt notions; and though he never had himſelf a parochial cure of ſouls, it was the deſire and pleaſure of his life to make himſelf uſeful in the pulpit wherever he was, whether in town or in the moſt obſcure corner of the country. Four or five volumes of his ſermons have been publiſhed ſince his death.

In the year 1787 he publiſhed, under the name of an undergraduate of the univerſity of Oxford, *a letter to Dr Prieſtley*, in which he made that oracle of Socinianiſm almoſt as ridiculous as, in the letter to Dr Smith, he had formerly made the hero of modern ſcepticiſm.

The merits of Dr Horne, which had made him preſident of Magdalen College, a king's chaplain, and dean of Canterbury, raiſed him, we think in the year 1790, to the ſee of Norwich; and he had ſoon an opportunity of ſhewing that he had not loſt ſight of his ſpiritual character in the ſplendor of the peer of parliament. The Scotch Epiſcopalians had for ſome time been ſoliciting the legiſlature to repeal certain penal laws of uncommon ſeverity, under which they had groaned for upwards of forty years; but they found it a work of no little difficulty to make the equity of their claim generally underſtood*. In removing this difficulty no man was more aſſiſting to them than the Dean of Canterbury, to whom their religious and political principles were well known; and he continued his aſſiſtance after he was biſhop of Norwich. Indeed the whole bench ſhewed, on this occaſion, a zeal for the intereſts of true religion every way becoming their character of Chriſtian biſhops; and after Dr Horne was removed to a better world, the Scotch Epiſcopalians found among his ſurviving brethren friends as zealous and active as he.

* See SCOTCH EPISCOPALIANS in this *Supplement*.

Dr Horne, though a very handſome man, was not naturally of a ſtrong conſtitution; and from the diſadvantage of being uncommonly near ſighted, he had not been able to increaſe its ſtrength by the practice of any athletic exerciſe. The only amuſement in which he took delight was agreeable converſation; and his life was therefore what is called ſedentary. The conſequence of this was, that the infirmities of age came faſt upon him; and when the deſign was formed of making him a biſhop, he felt himſelf little inclined to undertake the charge of ſo weighty an office. He was, however, prevailed upon to accept of the ſee of Norwich; but he enjoyed his new dignity for a very ſhort period, if he can with truth be ſaid to have *enjoyed* it at all. His health declined rapidly; and, in the autumn of 1791, he ſuffered, while on the road from Norwich to Bath, a paralytic ſtroke, the effects of which he never recovered. He lingered a month or two, with ſuch apparent changes in the ſtate of his health as ſometimes gave deluſive hopes to his family, till the 17th of January 1792, when he died in the 62d year of his age, with thoſe hopes which can be excited only by the conſciouſneſs of a well ſpent life, and by a firm truſt in the promiſes of the goſpel.

In this ſhort ſketch of the life of biſhop Horne we have taken the liberty to expreſs our diſſent from ſome of his opinions, and to ſtate the reaſons on which that diſſent reſts. By himſelf we know that this part of our conduct would have been applauded; but it is poſſible that by ſome of his friends it may be deemed diſreſpectful to his memory. To theſe gentlemen we beg leave to obſerve, that if Johnſon made the praiſe of *Kyrl*, Pope's man of Roſs, really more ſolid by making it more credible, it will be difficult to perſuade us that we have done any injury to Dr Horne's fame by avoiding the extravagant panegyric of thoſe who ſeem to have conſidered him as a man exempted from error. He was firſt induced to favour the Hutchinſonians becauſe he thought he perceived danger to religion in the Newtonian doctrines of attraction and repulſion; and we very readily admit that many Newtonians, not underſtanding the doctrines of their maſter, have expreſſed themſelves in ſuch a manner as could not render a religious man partial to their ſyſtem. But from the dangers of miſtake no ſyſtem, whether religious or philoſophical, was ever free; and the atheiſtical purpoſes which the agency of ethers and celeſtial fluids has lately been made to ſerve, muſt induce every man of piety to pauſe before he admit ſuch agency. Dr Horne lived to witneſs ſome of its pernicious effects; and we have reaſon to believe that they made a due impreſſion on his mind; but he ſpent his latter years, as indeed he had ſpent the greater part of his life, in nobler purſuits than the ſtudy of human ſcience; he ſpent them in the proper employments of a Chriſtian, a clergyman, and a biſhop. His faith was founded on a rock; and it was that genuine faith which worketh by love; for though his preferments were rich, his charity kept pace with them; and it has been proved that, notwithſtanding his proper economy, he hoarded not one ſhilling of his annual income. This was an elevation of character above all literary, above all philoſophic fame. The author of this article had the honour to be known to Dr Horne, to enjoy, if he miſtook not, a ſhare in his friendſhip, and to correſpond with him regularly for many years; and there is not one of his rational admirers who more fully admits the truth of the character given of him by Dr Thurlow late biſhop of Durham when ſucceeding him in the office of proctor in the Univerſity. "As to the laſt proctor (ſaid he) I ſhall ſpeak of him but in few words, for the truth of which I can appeal to all that are here preſent. If ever virtue itſelf was viſible and dwelt upon earth, it was in the perſon who this day lays down his office."

Soon after he was advanced to the preſidentſhip of Magdalen college, this great and good man married the only daughter of Philip Burton, Eſq; a gentleman of conſiderable fortune. By this lady he had three daughters, of whom the eldeſt was married to a clergyman a ſhort time before the death of her father, and the two younger were, in 1796, reſiding with Mrs Horne in Hertfordſhire.

HORN-TOWN, a village in Maryland, 31 miles from Snowhill, 26 from Drummond, or Accomack court-houſe, in Virginia, and 168 from Philadelphia. —*Morſe.*

HOROGRAPHY, the art of making or conſtructing dials; called alſo dialling, horologiography, gnomonica, ſciatherica, photoſciatherica, &c.

HOROPTER, in optics, is a right line drawn through the point where the two optic axes meet, parallel to that which joins the centres of the two eyes, or the two pupils.

HORSENECK-FIELD-POINT, a round bluff on the coaſt of Greenwich townſhip in Connecticut, 2 miles E. of the New-York line at Byram river.—*Morſe.*

HORSENECK, a point of land, on the north ſide of Long-Iſland, between Hog's Neck and Eaſton's Neck. —*ib.*

HORSENECK, a town in Fairfield county, Connecticut, called by the Indians *Pai hom ſing*, was ſettled in 1680. It lies ſix miles N. E. of Rye, in Weſt-Cheſter county, New-York State. A bloody battle was fought here between the Dutch and the Indians, in 1646. The Dutch with great difficulty gained the victory. Great numbers were ſlain on both ſides; and their graves appear to this day. It is 53 miles S. W. of New-Haven, and 37 N. E. of New-York city.—*ib.*

HORSENECK, a village in Eſſex county, New-Jerſey, on the ſouthern bank of Paſſaic river above the Little Falls, four miles S. W. by S. of the town of Patterſon.—*ib.*

HORSE-SHOE, in fortification, is a work ſometimes of a round, ſometimes of an oval figure, incloſed with a parapet, raiſed in the ditch of a marſhy place, or in low grounds; ſometimes alſo to cover a gate; or to ſerve as a lodgment for ſoldiers, to prevent ſurpriſes, or relieve an over tedious defence.

HORSHAM, a townſhip in Montgomery county, Pennſylvania.—*Morſe.*

HOSACK, or *Hooſack*, a townſhip in Renſſalaer county, New-York, ſituated on the eaſtern boundary of the State, contains 3035 inhabitants, 419 of whom are electors.—*ib.*

HOVEN is a word of the ſame import with *raiſed, ſwelled, tumefied.* It is particularly applied to black cattle and ſheep, when from eating too voraciouſly of clover, or any other ſucculent food, they become ſwollen. Such cattle are, in the language of the farmer, called, *Hoven-Cattle*; and the beaſt, whether bullock or ſheep, which is hoven, when left without relief, dies in half an hour. The cauſe of the diſeaſe is the extra-quantity of air taken down with that kind of food, which, in its paſſage from the paunch upwards, forces the broad leaves of the clover before it, till they cloſe up the paſſage at the entrance of the paunch, and prevent the wind from going upwards in its regular courſe. The uſual method of relief is to ſtab the animal in the paunch; an operation which is always dangerous, and has often proved fatal. It was therefore with good reaſon that the Society for the Encouragement of Arts, Manufactures, and Commerce, voted a bounty of fifty guineas to Mr Richard Eager of Graffham farm, near Guildford, for making public a very ſimple method practiſed by him for the cure of hoven cattle. It is this; "let the grazier or farmer have always ready ſmooth knobs of wood, of different ſizes, fixed to the end of a flexible cane, which for oxen ſhould be at leaſt ſix feet long, and for ſheep three feet. When a beaſt is hoven, let one perſon take hold of him by the noſtril and one horn; let another hold his tongue faſt in one hand, putting the cane down his throat with the other. Be careful not to let the animal get the knob of the cane between his grinders: obſerve alſo to put the cane far enough down; the whole length will not injure. You will find the obſtacle at the entrance of the paunch: puſh the cane hard, and when you perceive a ſmell to come from the paunch, and the animal's body to ſink, the cure is performed, and Nature will act for itſelf."

This method, we doubt not, will prove ſucceſsful; but might not the purpoſe be as well, if not better, effected, by uſing, inſtead of the cane and knob, a piece of thick ſtiff rope, which, in many places of Scotland, is employed to force down turnips or potatoes when they ſtick in the throat of a bullock?

HOUGHTON (——) is a man to whom the ſcience of geography is ſo much indebted, that we are almoſt aſhamed to confeſs that we know not his Chriſtian name, the place where he was born, or the age at which he died. He had been a captain in the 69th regiment, and in the year 1779 had acted under General Rooke as fort major in the iſland of Goree. Hearing, ſome time in the year 1789, or perhaps earlier, that the African aſſociation wiſhed to penetrate to the Niger by the way of Gambia, he expreſſed his willingneſs to undertake the execution of their plan. For this taſk he was peculiarly fitted. A natural intrepidity of character, which ſeemed inacceſſible to fear, and an eaſy flow of conſtitutional good humour, which even the rougheſt accidents of life were not able to ſubdue, formed him for exploring the country of relentleſs ſavages; whilſt the darkneſs of his complexion was ſuch, that he ſcarcely differed in appearance from the Moors of Barbary, whoſe dreſs in travelling he intended to aſſume.

His inſtructions from the aſſociation were, to aſcertain the courſe, and, if poſſible, the riſe and termination of the Niger; and after viſiting the cities of TOMBUCTOO and HOUSSA (ſee theſe articles in this *Supplement*), to return by the way of the deſart, or by any other route which the circumſtances of his ſituation at the time might recommend to his choice.

Proceedings of the African Aſſociation.

Having left England on the 16th of October 1790, he arrived at the entrance of the Gambia on the 10th of November, and was kindly received by the king of Barra, who remembered the viſit which the Major had formerly paid him from the iſland of Goree; and who now, in return for a ſmall preſent of the value of 20s. cheerfully tendered protection and aſſiſtance as far as his dominion or influence extended.

An offer from the maſter of an Engliſh veſſel employed in the trade of the river, enabled the Major, and the interpreter he had engaged on the coaſt, to proceed to Junkiconda; where he purchaſed from the natives a horſe and five aſſes, and prepared to paſs with the merchandiſe which conſtituted his travelling fund, to Medina, the capital of the ſmall kingdom of Woolli.

Fortunately for him, a few words, accidentally dropped by a negro woman in the Mandingo language, of which he had haſtily acquired a ſuperficial knowledge, excited ſuſpicions of danger; and gave him intimation of a conſpiracy which the negro miſtreſſes of the traders, who feared that the Major's expedition portended the ruin of their commerce, had formed againſt his life. Afraid, therefore, of travelling by the cuſtomary route, he availed himſelf of the opportunity which the dry ſeaſon and the tide of ebb afforded of ſwimming his horſe and his aſſes acroſs the ſtream; and having by thoſe means avoided the parties who were ſent for his deſtruction, he proceeded with much difficulty on the ſouthern ſide of the river, to that diſtrict of Cantor which is oppoſite to the kingdom of Woolli. There he repaſſed the Gambia, and ſent a meſſenger to inform the king of his arrival, and to requeſt a guard for his protection.

An eſcort, commanded by the king's ſon, was immediately diſpatched; and the Major, whoſe intended preſent had been announced, was kindly received, and hoſpitably entertained at Medina.

The town is ſituated at the diſtance of about 900 miles by water from the entrance of the Gambia; and the country adjacent abounds in corn and cattle, and, generally ſpeaking, in all things that are requiſite for the ſupport, or eſſential to the comfort of life. Two different ſects of religion diſtinguiſh rather than divide the people; the one is compoſed of the profeſſors of the Mahomedan faith, who are called Buſhreens; the other, and, it is ſaid, the more numerous, conſiſts of thoſe who, denying the miſſion of the prophet, avow themſelves deiſts, and from their cuſtom of drinking with freedom the liquors of which he prohibited the uſe, are denominated Sonikees or drinking men.

In a letter from Major Houghton to his wife, which a ſeaman preſerved from the wreck of a veſſel in which the diſpatches to the ſociety were loſt, the Major indulged the reflections that naturally aroſe from his paſt and preſent ſituations. A bilious fever had attacked him ſoon after his arrival in the Gambia; but his health was now unimpaired—a conſpiracy had aſſailed his life; but the danger was paſſed—the journey from Junkiconda had expoſed him to innumerable hardſhips; but he was now in poſſeſſion of every gratification which the kindneſs of the king or the hoſpitality of the people could enable him to enjoy. Delighted with the healthineſs of the country, the abundance of the game, the ſecurity with which he made his excurſions on horſeback, and above all, with the advantages that would attend the erection of a fort on the ſalubrious and beautiful hill of Fatetenda, where the Engliſh once had a factory, he expreſſes his earneſt hope that his wife will hereafter accompany him to a place in which an income of ten pounds a year will ſupport them in affluence; and that ſhe will participate with him in the pleaſure of rapidly acquiring that vaſt wealth which he imagines its commerce will afford.

While, in this manner, he indulged the dream of future proſperity, and with ſtill more ample ſatisfaction contemplated the eclat of the diſcoveries for which he was preparing, but in the purſuit of which he was retarded by the abſence of the native merchant, for whoſe company he had engaged, he found himſelf ſuddenly involved in unexpected and irreſiſtible misfortune. A fire, the progreſs of which was accelerated by the bamboo roofs of the buildings, conſumed with ſuch rapidity the houſe in which he lived, and with it the greateſt part of Medina, that ſeveral of the articles of merchandize, to which he truſted for the expences of his journey, were deſtroyed; and to add to his affliction, his faithleſs interpreter, who had made an ineffectual attempt on his goods, diſappeared with his horſe and three of his aſſes; a trade gun which he had purchaſed on the river ſoon afterwards burſt in his hands, and wounded him in the face and arm: and though the hoſpitable kindneſs of the people of the neighbouring town of Barraconda, who cheerfully opened their houſes to more than a thouſand families, whoſe tenements the flames had conſumed, was anxiouſly exerted for his relief; yet the loſs of his goods, and the conſequent diminution of his travelling fund, were evils which no kindneſs could remove.

It was in this ſituation that, wearied with the fruitleſs hope of the return of the native trader, with whom he had contracted for his journey, he reſolved to avail himſelf of the company of another ſlave merchant, who was lately arrived from the ſouth, and was now on his way to his farm on the frontier of the kingdom of Bambouk. Accordingly, on the evening of the 8th of May, he proceeded by moon light and on foot, with his two aſſes, which the ſervants of the ſlave merchant offered to drive with their own, and which carried the wreck of his fortune; and journeying by a north-eaſt courſe, arrived on the fifth day at the uninhabited frontier which ſeparates the kingdoms of Woolli and Bondou.

He had now paſſed the former limit of European diſcovery; and while he remarked with pleaſure the numerous and extenſive population of this unviſited country, he obſerved, that the long black hair and copper complexion of the inhabitants announced their Arab original. They are a branch of that numerous tribe which, under the appellation of Foolies, have overſpread a conſiderable part of Senegambia; and their religious diſtinctions are ſimilar to thoſe which prevail in the kingdom of Woolli.

A journey of 150 miles, which was often interrupted by the engagements of his companion, who traded in every town, conducted him to the banks of the Falemé, the ſouth-weſtern boundary of the kingdom of Bambouk. Its ſtream was exhauſted by the advanced ſtate of the dry ſeaſon, and its bed exhibited an appearance of ſlate intermixed with gravel.

Bambouk is inhabited by a nation, whoſe woolly hair and ſable complexions beſpeak them of the negro race, but whoſe character ſeems to be varied in proportion as the country riſes from the plains of its weſtern diviſion to the highlands of the eaſt. Diſtinguiſhed into ſects, like the people of Woolli and Bondou, by the different tenets of Mahomedans and Deiſts, they are equally at peace with each other, and mutually tolerate the reſpective opinions they condemn.

Agriculture and paſturage, as in the negro ſtates on the coaſt of the Atlantic, are their chief occupations; but the progreſs which they have made in the manufacturing arts, is ſuch as enables them to ſmelt their iron ore, and to furniſh the ſeveral inſtruments of huſbandry and war. Cloth of cotton, on the other hand, which in this part of Africa ſeems to be the univerſal wear, they appear to weave by a difficult and laborious proceſs; and to theſe two circumſtances it is probably owing, that with them the meaſure of value is not, as on the coaſt, a bar of iron, but a piece of cloth.

The common vegetable food of the inhabitants appears to conſiſt of rice; their animal, of beef or mutton. A liquor, prepared from fermented honey, ſupplies the want of wine, and furniſhes the means of thoſe feſtive entertainments that conſtitute the luxury of the court of Bambouk.

On the Major's arrival at the banks of the river Falemé, he found that the war which had lately ſubſiſted between the kings of Bondou and Bambouk was terminated by the ceſſion to the former of the conqueſts he had made in the low land part of the dominions of the latter; and that the king of Bondou had taken up his reſidence in the territory which he had thus obtained.

The Major haſtened to pay his reſpects to the victorious prince, and to offer a ſimilar preſent to that which the kings of Barra and Woolli had cheerfully accepted; but to his great diſappointment an ungracious reception, a ſullen permiſſion to leave the preſent, and a ſtern command to repair to the frontier town from which he came, were followed by an intimation that he ſhould hear again from the king. Accordingly, on the next day, the king's ſon, accompanied by an armed attendance, entered the houſe in which the Major had taken up his temporary dwelling, and demanded a ſight of all the articles he had brought. From theſe the prince ſelected whatever commodities were beſt calculated to gratify his avarice, or pleaſe his eye; and to the Major's great diſappointment, took from him the blue coat in which he hoped to make his appearance on the day of his introduction to the Sultan of Tombuctoo. Happily, however, a variety of articles were ſucceſsfully concealed, and others of inferior value were not conſidered as ſufficiently attractive.

The Major now waited with impatience for the performance of the promiſe which the ſlave merchant, with whom he had travelled from the Gambia, had made of proceeding with him to Tombuctoo; but as the merchant was obliged to ſpend a few days at his rice farm on the banks of the Falemé, the Major accepted an invitation to the hoſpitality of his roof. There he obſerved, with extreme regret, that the apprehenſion of a ſcarcity of grain had alarmed his friend; and that, dreading the conſequences of leaving his family in ſo perilous a ſeaſon to the chances of the market, he had determined on collecting, before his departure, a ſufficient ſupply for their ſupport. This argument for delay was too forcible to be oppoſed; and therefore the Major reſolved to employ the interval in viſiting the king of Bambouk, who reſided in the town of Ferbanna, on the eaſtern ſide of the Serra Coles, or river of Gold. Unfortunately, however, by a miſtake of his guide, he loſt his way in one of the vaſt woods of the country; and as the rainy ſeaſon, which commenced with the new moon on the 4th of July, and was introduced with a weſterly wind, was now ſet in, the ground on which he paſſed the night was deluged with rain, while all the ſky exhibited that continual blaze of lightning, which in thoſe latitudes often accompanies the tornado. Diſtreſſed by the fever, which began to aſſail him, the Major continued his route at the break of day, and waded with difficulty through the river Serra Coles, which was ſwelled by the floods, and on the banks of which the alligators were baſking in the temporary ſun-ſhine.

Scarcely had he reached Ferbanna when his fever roſe to a height that rendered him delirious; but the ſtrength of his conſtitution, and the kindneſs of the negro family to which his guide had conducted him, ſurmounted the dangerous diſeaſe; and in the friendly reception which was given him by the king of Bambouk, he ſoon forgot the hardſhips of his journey. The king informed him, that the loſſes he had lately ſuſtained in the conteſt with the armies of Bondou, aroſe from his having exhauſted his ammunition; for, as the French traders, who formerly ſupplied his troops, had abandoned the fort of St Joſeph, and, either from the dryneſs of the laſt ſeaſon, or from other cauſes, had deſerted the navigation of the upper part of the Senegal, he had no means of repleniſhing his ſtores; whereas his enemy, the king of Bondou, continued to receive from the Britiſh, through the channel of his agents on the Gambia, a conſtant and adequate ſupply.

Major Houghton availed himſelf of the opportunity which this converſation afforded, to ſuggeſt to the king the advantage of encouraging the Britiſh to open a trade by the way of his dominions to the populous cities on the banks of the Niger.

Such was the ſtate of the negociation, when all buſineſs was ſuſpended by the arrival of the annual preſents of Mead, which the people of Bambouk, at that ſeaſon of the year, are accuſtomed to ſend to their king; and which are always followed by an intemperate feſtival of ſeveral ſucceſſive days.

In the interim, the Major received, and gladly accepted, the propoſal of an old and reſpectable merchant of Bambouk; who offered to conduct him on horſeback to Tombuctoo, and to attend him back to the Gambia. A premium of L. 125, to be paid on the Major's return to the Britiſh factory at Junkiconda, was fixed by agreement as the merchant's future reward. It was further determined, that the Major ſhould be furniſhed with a horſe in exchange for his two aſſes; and ſhould convert into gold duſt, as the moſt portable fund, the ſcanty remains of the goods he had brought from Great Britain.

This plan was much approved by the king, to whom the merchant was perſonally known; and who gave to the Major at parting, as a mark of his eſteem, and a pledge of his future friendſhip, a preſent of a purſe of gold. With an account of theſe preparations the Major cloſed his laſt diſpatch, of the 24th July 1791; and the African aſſociation entertained for ſome time ſanguine hopes of his reaching Tombuctoo. Alas! theſe hopes were blaſted. Mr Park, who ſucceeded him in the arduous taſk of exploring that ſavage country, learned, that having reached JARRA (See that article in this *Supplement*), he there met with ſome Moors who were travelling to Tiſheet (a place by the ſalt pits in the Great Deſart, ten days journey to the northward) to purchaſe ſalt; and that the Major, at the expence of ſome tobacco and a muſket, engaged them to convey him thither. It is impoſſible (ſays Mr Park) to form any other opinion on this determination, than that the Moors intentionally deceived him with a view to rob, and leave him in the Deſart. At the end of two days he ſuſpected their treachery, and inſiſted on returning to Jarra. Finding him perſiſt in this determination, the Moors robbed him of every thing which he poſſeſſed, and went off with their camels. Being thus deſerted, he returned to a watering place, in poſſeſſion of the Moors, called Farra; and being by theſe unfeeling wretches refuſed food, which he had not taſted for ſome days, he ſunk at laſt under his misfortunes. Whether he actually died of hunger, or was murdered outright by the ſavage Mahometans, Mr Park could not learn; but he was ſhewn at a diſtance the ſpot in the woods to which his body was dragged, and where it was left a prey to corruption.

Thus periſhed, in the prime of life, Major Houghton, a man whoſe travels enlarged the limits of European diſcovery, and whoſe accounts of the places which he viſited were ſtrongly confirmed by the intelligence which the Britiſh conſul at Tunis collected from the Barbary merchants.

HOUSSA, the capital of an African empire, on the banks of the Niger, is a city which has excited much curioſity among men of ſcience, ſince it was firſt mentioned to a committee of the African Aſſociation about the year 1790. The perſon from whom they received their information was an Arab, of the name of Shabeni; who ſaid that the population of Houſſa, where he had reſided two years, was equalled only (ſo far as his knowledge extended) by that of London and Cairo: and, in his rude unlettered way, he deſcribed the government as monarchical, yet not unlimited; its juſtice as ſevere, but directed by written laws; and the rights of landed property as guarded by the inſtitutions of certain hereditary officers, whoſe functions appear to be ſimilar to thoſe of the Canongoes of Hindoſtan (See CANONGOES, in this *Suppl.*); and whoſe important and complicated duties imply an unuſual degree of civilization and refinement. For the probity of the merchants of Houſſa, the Arab expreſſed the higheſt reſpect; but remarked, with indignation, that the women were admitted to ſociety, and that the honour of the huſband was often inſecure. Of their written alphabet he knew no more, than that it is perfectly different from the Arabic and the Hebrew characters; but he repreſented the art of writing as common in Houſſa. And when he deſcribed the manner in which their pottery is made, he gave, unknowingly to himſelf, a repreſentation of the ancient Grecian wheel. In paſſing to Houſſa from Tombuctoo, in which laſt city he had reſided ſeven years, he found the banks of the Niger more numerouſly peopled than thoſe of the Nile, from Alexandria to Cairo; and his mind was obviouſly impreſſed with higher ideas of the wealth and grandeur of the empire of Houſſa, than of thoſe of any kingdom which he had ſeen, England alone excepted.

The exiſtence of the city of Houſſa, and of the empire thus deſcribed by Shabeni, was ſtrongly confirmed by letters which the committee received from his Majeſty's conſuls at Tunis and Morocco; and it has been put beyond all poſſibility of doubt by Mr Park, who received from various perſons ſuch concurring accounts of it, as could not be the offspring of deliberate falſehood. From a well informed ſhereeff, who had viſited Houſſa, and lived ſome years at Tombuctoo, he learned, that the former of theſe cities was the largeſt that the ſhereef had ever ſeen; and by comparing this man's account of its population with that of various other cities, of which Mr Park had ſeen one or two, we can hardly eſtimate the inhabitants of Houſſa at a leſs number than 100,000. Many merchants, with whom our traveller converſed, repreſented Houſſa as larger, and more populous than Tombuctoo, and the trade, police, and government as nearly the ſame in both. In that caſe, the king of Houſſa and chief officers of ſtate muſt be Moors, and zealots for the Mahometan religion; but they cannot be ſo intolerant as the ſovereign of Tombuctoo and his miniſters; for in Houſſa, Mr Park was told that the negroes are in greater proportion to the Moors than in Tombuctoo, and that they have likewiſe ſome ſhare in the government. According to accounts derived from Barbary merchants, the people of Houſſa have the art of tempering their iron with more than European ſkill; and their files in particular are much ſuperior to thoſe of Great Britain and France. The conſuls at Tunis and Morocco aſſured the committee of the African Aſſociation, that at both theſe courts the eunuchs of the ſeraglio are brought from Houſſa.

To thoſe who may ſtill entertain doubts of ſo much refinement being to be found in the interior parts of a country, conſidered as peculiarly ſavage, we ſhall only obſerve, in the words of the committee of aſſociation, that it is by no means "impoſſible that the Carthaginians, who do not appear to have periſhed with their cities, may have retired to the ſouthern parts of Africa; and though loſt to the Deſart, may have carried with them to the new regions which they occupy, ſome portion of thoſe arts and ſciences, and of that commercial knowledge, for which the inhabitants of Carthage were once ſo eminently famed. In Major Rennel's laſt map of North Africa, Houſſa is placed in 16° and about 20′ N. L. and 4° 30′ E. Long.

HOUSATONICK, a river of Connecticut, in the Indian language ſignifying *over the mountain*, riſes by two ſources; the one in Laneſborough, the other in Windſor, both in Berkſhire county, Maſſachuſetts. Theſe branches form a junction near Saliſbury, and the river after paſſing through a number of towns, empties itſelf into Long-Iſland Sound, between Stratford and Milford in Connecticut. It is navigable about 12 miles, to Derby. A bar of ſhells, however, at its mouth, obſtructs the navigation of large veſſels. In this river, between Saliſbury and Canaan, is a cataract, where the water of the whole river, which is 150 yards wide, falls perpendicularly 60 feet.—*Morse.*

HOUZOUANAS are a wandering people, who inhabit that part of Africa, which, in a direction from eaſt to weſt, extends from Caffraria to the country of the Greater Nimiquas (ſee NIMIQUAS, in this *Suppl.*) According to the map prefixed to Vaillant's new travels, the diſtrict occupied by the Houzouanas lies between 16° and 29° eaſt longitude. Of its breadth from ſouth to north we are ignorant; but it begins at the 23d parallel, and ſtretches northward probably a great way.

M. Vaillant is inclined to believe, that the Houzouanas are the original ſtem of the various nations, inhabiting at preſent the ſouthern part of Africa, and that from them all the tribes of the eaſtern and weſtern Hottentots are deſcended. The people themſelves know nothing of their origin; but to the queſtions that are put to them on the ſubject, they always reply, that they inhabit the country which was inhabited by their anceſtors. At the Cape, M. Vaillant received the following account of them, which, though he does not warrant its authenticity, has much the appearance of being authentic.

When the Europeans firſt eſtabliſhed themſelves at the Cape, the Houzouanas inhabited the country of Camdebo, the ſnowy mountains, and the diſtrict that ſeparates theſe mountains from Caffraria. Become neighbours to the colony, in conſequence of its extending itſelf towards them, they at firſt lived on peaceable terms with the planters; and, as they diſplayed more intelligence and greater activity than the Hottentots, they were even employed in preference to aſſiſt in cultivating the land and in forming the ſettlement. This good underſtanding and harmony were, however, ſoon interrupted by that multitude of lawleſs banditti ſent from Holland to people the country.

Thoſe worthleſs profligates wiſhed to enjoy the fruits of the land without the trouble of tilling it. Educated, beſides, with all the prejudices of the whites, they imagined that men of a different colour were born only to be their ſlaves. They accordingly ſubjected them to bondage, condemned them to the moſt laborious ſervices, and repaid thoſe ſervices with harſh and ſevere treatment. The Houzouanas, incenſed at ſuch arbitrary and tyrannical conduct, refuſed any longer to work for them, and retired to the defiles of their mountains. The planters took up arms and purſued them; they maſſacred them without pity, and ſeized on their cattle and their country. Thoſe who eſcaped their atrocities betook themſelves to flight, and removed to the land which they now occupy; but, on quitting their former poſſeſſions, they ſwore, in their own name and that of their poſterity, to exterminate thoſe European monſters, to be revenged againſt whom they had ſo many incitements. And thus, if tradition be true, was a peaceful and induſtrious nation rendered warlike, vindictive, and ferocious.

This hatred has been perpetuated from generation to generation, though the Houzouanas of the preſent day are ignorant of the original cauſe of it. Bred up with an invincible averſion to the planters, they know only that they are animated to plunder and deſtroy them; but it is only by a vague ſentiment of deteſtation, with the ſource of which they are unacquainted; and which, though it renders them cruel towards the planters, does not prevent them from being good, kind, and humane, towards each other.

The Houzouanas, being known only by their incurſions and plundering, are in the colonies often confounded with the Boſhmen, and diſtinguiſhed by the ſame appellation. Sometimes, however, from their tawny colour, they are called Chineſe Hottentots; and, by means of this double denomination, ill-informed travellers may eaſily be led into an error, of which the conſequence muſt be, that their narratives will be replete with abſurdity and falſehoods.

Their real name, and the only one which they give themſelves, is that of Houzouana; and they have nothing in common with the Boſhmen, who are not a diſtinct people, but a mere collection of fugitives and free-booters. The Houzouanas form no alliances but among themſelves. Being almoſt always at war with the ſurrounding nations, they never mix with them; and, if they conſent at any time to admit a ſtranger into their hordes, it is only after a long acquaintance, a ſort of apprenticeſhip, during which he has given proofs of his fidelity, and eſtabliſhed his courage. Such indeed are their courage and predatory habits, that they are the dread of all the ſurrounding tribes; and the Hottentots who accompanied M. Vaillant trembled at the very thought of entering the Houzouana territories. Nay, after they had lived many days among them, and had experienced their fidelity, they continued under the daily apprehenſion of being maſſacred by them. Yet one of their own countrymen, who had lived long among the Houzouanas, gave ſuch a character

ter of that people as ſhould have baniſhed thoſe idle fears.

"The Houzouanas (ſaid he) are by no means what you ſuppoſe them to be, murderers by profeſſion. If they ſometimes ſhed blood, it is not from a thirſt of carnage, but to make juſt repriſals that they take up arms. Attacked and perſecuted by ſurrounding nations, they have found themſelves reduced to the neceſſity of flying to inacceſſible places among the barren mountains, where no other people could exiſt.

"If they find antelopes and damans to kill; if the nymphs of ants are abundant; or if their good fortune brings them plenty of locuſts—they remain within the precincts of their rocks; but if the proviſions neceſſary to ſubſiſtence fail, the nations in their neighbourhood muſt ſuffer. From the ſummits of their mountains, they ſurvey at a diſtance the countries around; and, if they obſerve cattle, they make an incurſion to carry them off, or ſlaughter them upon the ſpot, according to circumſtances; but though they rob, they never kill, except to defend their lives, or by way of retaliation to revenge an ancient injury.

"It happens ſometimes, however, that after very fatiguing expeditions they return without booty; either becauſe the objects of their attack have diſappeared, or becauſe they have been repulſed and beaten. In ſuch caſes, the women, exaſperated by hunger and the lamentation of their children crying for food, become almoſt furious with paſſion. Reproaches, inſult, and threats, are employed; they wiſh to ſeparate from ſuch daſtardly men, to quit huſbands deſtitute of courage, and to ſeek others who will be more anxious to procure proviſion for them and their children. In ſhort, having exhauſted whatever rage and deſpair could ſuggeſt, they pull off their ſmall apron of modeſty, and beat their huſbands about the head with it till their arms are weary of the exerciſe.

"Of all the affronts which they can offer, this is the moſt inſulting. Unable to withſtand it, the men in their turn become furious. They put on their war-cap, a ſort of helmet made with the ſkin that covers the neck of the hyæna, the long hair of which forms a creſt that floats over the head, and, ſetting out like madmen, never return till they have ſucceeded in carrying off ſome cattle.

"When they come back, their wives go to meet them, and extol their courage amidſt the fondeſt careſſes. In a word, nothing is then thought of but mirth and jollity; and, till ſimilar ſcenes are recalled by ſimilar wants, paſt evils are forgotten."

Such was the character given of this formidable people to M. Vaillant at his firſt interview with them; and during the long excurſions which he made in their company they did not belie it in a ſingle inſtance. In many reſpects they appeared to reſemble the Arabs, who, being alſo wanderers, and like them brave and addicted to rapine, adhere with unalterable fidelity to their engagements, and defend, even to the laſt drop of their blood, the traveller who civilly purchaſes their ſervices, and puts himſelf under their protection. In our author's opinion, if it be at all practicable to traverſe from ſouth to north the whole of Africa, it could only be under the conduct of the Houzouanas; and he really thinks that fifty men of their temperate, brave, and indefatigable nation, would be ſufficient to protect an enterprizing European through that long and hazardous journey.

Yet theſe people, ſo ſuperior both in body and mind to the other natives of South Africa, are but of low ſtature; and a perſon five feet four inches in height is accounted among them very tall; but in their little bodies, perfectly well proportioned, are united, with ſurpriſing ſtrength and agility, a certain air of aſſurance, boldneſs, and haughtineſs, which awes the beholder, and with which our author was greatly pleaſed. Of all the ſavage races, he ſaw none that appeared to be endowed with ſo active a mind, and ſo hardy a conſtitution.

Their head, though it exhibits the principle characteriſtics of that of the Hottentot, is, however, rounder towards the chin. They are alſo not ſo black in complexion; but have the lead colour of the Malays, diſtinguiſhed at the Cape by the name of *bouguinée*. Their hair, more woolly, is ſo ſhort that he imagined at firſt their heads to have been ſhaved. The noſe too is ſtill flatter than that of the Hottentots; or, rather, they ſeem altogether deſtitute of a noſe; what they have conſiſting only of two broad noſtrils which project at moſt but five or ſix lines. From this conformation of the noſe, a Houzouana, when ſeen in profile, is the reverſe of handſome, and conſiderably reſembles an ape. When beheld in front, he preſents, on the firſt view, an extraordinary appearance, as half the face ſeems to be forehead. The features, however, are ſo expreſſive, and the eyes ſo large and lively, that, notwithſtanding this ſingularity of look, the countenance is tolerably agreeable.

As the heat of the climate in which he lives renders clothing unneceſſary, he continues during the whole year almoſt entirely naked, having no other covering than a very ſmall jackal ſkin faſtened round his loins by two thongs, the extremities of which hang down to his knees. Hardened by this conſtant habit of nakedneſs, he becomes ſo inſenſible to the variations of the atmoſphere, that when he removes from the burning ſands of the level country to the ſnow and hoar-froſt of his mountains, he ſeems indifferent to, and not even to feel the cold.

His hut in no wiſe reſembles that of the Hottentot. It appears as if cut vertically through the middle; ſo that the hut of a Hottentot would make two of thoſe of the Houzouanas. During their emigrations, they leave them ſtanding, in order that, if any other horde of the ſame nation paſs that way, they may make uſe of them. When on a journey, they have nothing to repoſe on but a mat ſuſpended from two ſticks, and placed in an inclined poſition. They often even ſleep on the bare ground. A projecting rock is then ſufficient to ſhelter them; for every thing is ſuited to a people whoſe conſtitutions are proof againſt the ſevereſt fatigue. If however they ſtop anywhere to ſojourn for a while, and find materials proper for conſtructing huts, they then form a kraal; but they abandon it on their departure, as is the caſe with all the huts which they erect.

This cuſtom of labouring for others of their tribe announces a ſocial character and a benevolent diſpoſition. They are indeed not only affectionate huſbands and good fathers, but excellent companions. When they inhabit a kraal, there is no ſuch thing among them as private property; whatever they poſſeſs is in common.

mon. If two hordes of the ſame nation meet, the reception is on both ſides friendly ; they afford each other mutual protection, and confer reciprocal obligations. In ſhort, they treat one another as brethren, though perhaps they are perfect ſtrangers, and have never ſeen each other before.

Active and nimble by nature, the Houzouanas conſider it as amuſement to climb mountains, and the moſt elevated peaks ; and they conducted M. Vaillant, his ſervants and cattle, over precipices, and through defiles, which he and his Hottentots would have deemed abſolutely impaſſable. The only arms of this people are bows and arrows, in the uſe of which they are very expert. The arrows, which are uncommonly ſhort, are carried on the ſhoulder in a quiver, about eighteen inches in length, and four in diameter, made of the bark of the aloe, and covered with the ſkin of a large ſpecies of lizard, which theſe wanderers find in all their rivers, particularly on the banks of Orange and Fiſh River.

Nocturnal fires are a peculiar language underſtood and employed by almoſt all ſavage nations. None, however, have carried this art ſo far as the Houzouanas, becauſe none have ſo much need of underſtanding and bringing it to perfection. If it be neceſſary to announce a defeat or a victory, an arrival or departure, a ſucceſsful plundering expedition, or the want of aſſiſtance, in a word, any intelligence whatever, they are able, either by the number of their fires or the manner in which they arrange them, to make it known in an inſtant. They are even ſo ſagacious as to vary their fires from time to time, leſt their enemies ſhould become acquainted with their ſignals, and treacherouſly employ them in their turn to ſurpriſe them.

Our author ſays that he is unacquainted with the principles of theſe ſignals, invented with ſo much ingenuity. He did not requeſt information ; becauſe he very rationally inferred that his requeſt would not have been granted ; but he obſerved, that three fires kindled at the diſtance of twenty paces from each other, ſo as to form an equilateral triangle, were the ſignal for rallying.

Among the phyſical qualities, which, in M. Vaillant's opinion, prove that the Houzouanas are a diſtinct nation, he mentions the enormous natural rump of the women, as a deformity which diſtinguiſhes them from every other people, ſavage or poliſhed, which he had ever known. " I have ſeveral times (ſays he) had occaſion to remark, that, among the female Hottentots in general, as they advance in age, the inferior part of the back ſwells out, and acquires a ſize which greatly exceeds the proportion it bore in infancy with the other parts of the body. The Houzouana women, having in their figure ſome reſemblance to the Hottentots, and appearing, therefore, to be of the ſame race, one might be induced to believe that their projection behind is only the Hottentot rump more ſwelled and extended. I obſerved, however, that among the former this ſingularity was an excreſcence of ſlow growth, and in ſome meaſure an infirmity of old age ; whereas among the latter it is a natural deformity, an original characteriſtic of their race. The Houzouana mothers wear on their reins, like our miners, a ſkin which covers this protuberance of the poſteriors ; but which, being thin and pliable, yields to the quivering of the fleſh, and becomes agitated in the ſame manner. When on a journey, or when they have children too young to follow them, they place them upon their rump. I ſaw one of theſe women run in this manner with a child, about three years of age, that ſtood erect on its feet at her back, like a foot boy behind a carriage."

If one half of what our traveller ſays of the activity and enterpriſing ſpirit of this ſingular people be true, might not the African Aſſociation, now that the Cape is a Britiſh province, ſend a ſecond Houghton, or ſecond Park, to make diſcoveries in that unexplored country, under the protection of the Houzouanas ? We do not indeed think that it would be poſſible to traverſe the whole extent of Africa from ſouth to north, but Vaillant penetrated farther in that direction than any one had done before him ; and it appears, that with his intrepid Houzouanas he might have penetrated much farther.

HOWLAND'S *Ferry*, is the narrow part of the waters that ſeparate Rhode-Iſland from the main land. It is about a quarter of a mile wide. The bridge built acroſs this ſtrait coſt 30,000 dollars, and was carried away by a ſtorm in January, 1796. It is rebuilt. —*Morſe.*

HUBBARDSTON, a townſhip in Worceſter county, Maſſachuſetts, and formed the N. E. quarter of Rutland, until incorporated in 1767. It borders on the weſtern part of Wachuſet Hill, and contains 933 inhabitants. It is 20 miles N. W. of Worceſter, and 60 W. of Boſton.—*ib.*

HUDSON'S BAY took its name from Henry Hudſon, who diſcovered it in 1610. It lies between 55 and 65 degrees of north latitude. The eaſtern boundary of the bay is Terra de Labrador; the northern part has a ſtraight coaſt, facing the bay, guarded with a line of iſles innumerable. A vaſt bay, called the Archiwinnipy Sea, lies within it, and opens into Hudſon's Bay, by means of Gulf Hazard, through which the Beluga whales paſs in great numbers. The entrance of the bay, from the Atlantic Ocean, after leaving, to the north, Cape Farewell and Davis's Straits, is between Reſolution Iſles on the north, and Button's Iſles, on the Labrador coaſt, to the ſouth, forming the eaſtern extremity of Hudſon's Straits. The coaſts are very high, rocky and rugged at top ; in ſome places precipitous, but ſometimes exhibit extenſive beaches. The iſlands of Saliſbury, Nottingham, and Digges are very lofty and naked. The depth of water in the middle of the bay is 140 fathoms. From Cape Churchill to the ſouth end of the bay, are regular ſoundings ; near the ſhore, ſhallow, with muddy or ſandy bottom. To the northward of Churchill, the ſoundings are irregular, the bottom rocky, and in ſome parts the rocks appear above the ſurface at low water. Hudſon's Bay is reckoned about 300 leagues wide, from north to ſouth. Its breadth is unequal, being about 130 leagues where broadeſt ; but it grows narrower at both extremities, being not much above 35 leagues in ſome places. The commerce in the countries adjacent to this inland ſea is in the hands of an excluſive Britiſh Company of its name, who employ only 4 ſhips, and 130 ſeamen. The forts, Prince of Wales, Churchill river, Nelſon, New Severn, and Albany, are garriſoned by 186 men. The French, in 1782, took and deſtroyed theſe ſettlements, &c. ſaid to amount to the value of £500,000 ſterling. The

Company's exports are to the amount of £16,000, moſtly the drugs of the market, which produce returns, chiefly in beaver ſkins and rich furs, to the value of £29,000; yielding government a clear revenue of £3,734. This includes the fiſhery in Hudſon's Bay. The ſkins and furs procured by this trade, when manufactured, afford articles for trading with many nations of Europe, to great advantage.—*ib.*

Hudson's Strait, or *Frobiſher's Miſtaken Strait*, which leads into Hudſon's Bay, in a weſterly courſe is 76 miles wide, between Cape Chidley and the S. point of Reſolution Iſland.—*ib.*

Hudson's House, one of the Hudſon's Bay Company's factories in N. America, lies on the S. W. ſide of Suſkaſhawan river, 100 miles eaſt of Mancheſter Houſe, and 167 S. E. by E. of Buckingham Houſe. N. lat. 53° 0′ 32″, W. long. 106° 27′ 20″.—*ib.*

Hudson's River paſſes its whole courſe in the State of New-York, and is one of the largeſt and fineſt rivers in the United States. It riſes in a mountainous country, between the lakes Ontario and Champlain. In its courſe ſoutheaſterly it approaches within 6 or 8 miles of lake George; then, after a ſhort courſe E. turns ſoutherly, and receives the Sacondaga from the S W. which heads in the neighbourhood of Mohawk river. The courſe of the river thence to New-York, where it empties into York Bay, is very uniformly S. 12° or 15° W. Its whole length is about 250 miles. From Albany to lake George is 65 miles. This diſtance, the river is navigable only for batteaux, and has two portages, occaſioned by falls, of half a mile each. The banks of Hudſon's river, eſpecially on the weſtern ſide, as far as the highlands extend, are chiefly rocky cliffs. The paſſage through the highlands, which is 16 or 18 miles, affords a wild romantic ſcene. In this narrow paſs, on each ſide of which the mountains tower to a great height, the wind, if there be any, is collected and compreſſed, and blows continually as through a bellows; veſſels, in paſſing through it are often obliged to lower their ſails. The bed of this river, which is deep and ſmooth to an aſtoniſhing diſtance, through a hilly, rocky country, and even through ridges of ſome of the higheſt mountains in the United States, muſt undoubtedly have been produced by ſome mighty convulſion in nature. The tide flows a few miles above Albany, which is 160 miles from New-York. It is navigable for ſloops of 80 tons to Albany, and for ſhips to Hudſon. Ship navigation to Albany is interrupted by a number of iſlands, and ſhoals 6 or 8 miles below the city, called the *Overſlaugh.* It has been in contemplation to confine the river to one channel, by which means it will be deepened, and the difficulty of approaching Albany with veſſels of a larger ſize, be removed. About 60 miles above New-York the water becomes freſh. The river is ſtored with a variety of fiſh, which renders a ſummer paſſage to Albany, delightful and amuſing to thoſe who are fond of angling. The advantages of this river for carrying on the fur trade with Canada, by means of the lakes, are very great. Its conveniencies for internal commerce are ſingularly happy. The produce of the remoteſt farms is eaſily and ſpeedily conveyed to a certain and profitable market, and at the loweſt expenſe. In this reſpect, New-York has greatly the advantage of Philadelphia. A great proportion of the produce of Pennſylvania, is carried to market in waggons, over a great extent of country, ſome of which is rough; hence it is that Philadelphia is crowded with waggons, carts, horſes and their drivers, to do the ſame buſineſs that is done in New-York, where all the produce of the country is brought to market by water, with much leſs ſhew and parade. But Philadelphia has other advantages, to compenſate for this natural defect. The increaſing population of the fertile lands upon the northern branches of the Hudſon, muſt annually increaſe the amazing wealth that is conveyed by its waters to New-York. The northern and weſtern canals, when completed, will be of incalculable advantage to the trade of this State.—*ib.*

Hudson's River, a broad but ſhort river emptying into Cheſapeak Bay, in Dorcheſter county, Maryland. Hill's Point, N. E. of it, ſhapes the broad mouth of the river.—*ib.*

Hudson City, a port of entry and poſt-town ſituated in Columbia county, New-York, on the eaſt ſide of Hudſon's river, 30 miles S. by E. of Albany, and 132 north of New-York city. The limits of the corporation include a ſquare mile, and its privileges as a port of entry extend no farther. In the autumn of 1783, Meſſrs. Seth and Thomas Jenkins, from Providence, in the State of Rhode-Iſland, fixed on the unſettled ſpot, whereon this city ſtands, for a town, to which the city is navigable for veſſels of any ſize. The city is laid out into large ſquares, bordering on the river, and divided into 30 lots. Other adventurers were admitted to proportions, and the town was laid out in ſquares, formed by ſpacious ſtreets, croſſing each other at right angles. Each ſquare contains 30 lots, two deep, divided by a 20 feet alley. Each lot is 50 feet in front and 120 feet in depth. In the ſpring of 1784, ſeveral houſes and ſtores were erected. The increaſe of the town from this period to the ſpring of 1786, two years only, was aſtoniſhingly rapid, and reflects great honour upon the enterpriſing and perſevering ſpirit of the original founders. In the ſpace of time juſt mentioned no leſs than 150 dwelling-houſes, beſides ſhops, barns, and other buildings, four ware-houſes, ſeveral wharves, ſpermaceti works, a covered ropewalk, and one of the beſt diſtilleries in America, were erected, and 1,500 ſouls collected on a ſpot, which three years before, was improved as a farm, and but two years before began to be built. Its increaſe ſince has been very rapid; a printing-office has been eſtabliſhed, and ſeveral public buildings have been erected, beſides dwelling houſes, ſtores, &c. The inhabitants are plentifully and conveniently ſupplied with water, brought to their cellars in wooden pipes, from a ſpring two miles from the town. It has a large bay to the ſouthward, and ſtands on an eminence from which are extenſive and delightful views to the N. W. N. and round that way to the S. E. conſiſting of hills and vallies, variegated with woods and orchards, cornfields and meadows, with the river, which is in moſt places a mile over, and may be ſeen a conſiderable diſtance to the northward, forming a number of bays and creeks. From the S. E. to the S. W. the city is ſcreened with hills, at different diſtances, and weſt afar off over the river and a large valley, the proſpect is bounded by a chain of ſtupendous mountains, called the Katts Kill, running to the W. N. W. which add magnificence and ſublimity to the whole ſcene. Upwards of 1200 ſleighs entered the city daily, for ſeveral days together, in February, 1786, loaded with grain of various kinds, boards, ſhingles, ſtaves, hoops, iron ware, ſtone for building, fire-wood, and ſundry articles of proviſion for the market, from which ſome idea may be formed of the advantage of its ſituation, with reſpect to the country adjacent, which is every way extenſive and fertile, particularly weſtward. The original proprietors of Hudſon, offered to purchaſe a tract of land adjoining the ſouth part of the city of Albany, and were conſtrained, by a refuſal of the propoſition, to become competitors for the commerce of the northern country, when otherwiſe they would have added great wealth and conſequence to Albany. There is a bank here, called Bank of Columbia, whoſe capital may not exceed 160,000 dollars. It is compoſed of 400 ſhares, at 400 dollars each. Hudſon city is governed by a mayor, recorder, 4 aldermen, 4 aſſiſtants, and a number of other officers. The number of inhabitants in *Hudſon Townſhip*, by the cenſus of 1790, amounted to 2,584, including 193 ſlaves; and it appears by the State cenſus of 1796 that 338 of the inhabitants are electors. Hudſon city is 4 miles S. W. of Claverack; 47 north of Poughkeepſie; and 43 ſouth of Lanſinburg.—*ib.*

HUGHESBURG, a town in Northumberland county, Pennſylvania, called alſo *Catawaſſy*, being ſituated at the mouth of Catawaſſy creek, 25 miles N. E. of Sunbury. It contains about 60 handſome houſes, and a meeting houſe for Friends. It is 144 miles N. W. of Philadelphia. N. lat. 40° 54′.—*ib.*

HULL, an inconſiderable town in Suffolk county, on the ſouth ſide of Boſton harbour, Maſſachuſetts, containing 120 inhabitants. On the fort on the eaſt hill there is a well ſunk 90 feet, which commonly has 80 odd feet of water.—*ib.*

HUMAS, an Indian village on the eaſt ſide of Miſſiſſippi river in Louiſiana, 60 miles above New Orleans. The Humas were formerly a conſiderable nation, but about 1770 were reduced to about 25 warriors. The Alabamas, whoſe villages are near thoſe of the Humas, had, at the above period, about 30 warriors, and followed the French here when they abandoned the poſt on Alabama river in 1762. The Chetimachas have about 27 warriors.—*ib.*

HUMMEL'S TOWN, a thriving town in Dauphine county, Pennſylvania, containing a German Lutheran church and about 90 houſes; ſituated on the ſouth ſide of Swetara creek, 6 miles north of Middletown, 10 E. by N. of Harriſburg, and 100 weſt-north-weſt of Philadelphia.—*ib.*

Hungary.

HUNGARY-WATER, is ſpirit of wine diſtilled upon roſemary, and which therefore contains its oily and ſtrong ſcented eſſence (ſee PHARMACY, n° 365, *Encycl.).* To be really good, ſays Profeſſor Beckmann, the ſpirit of wine ought to be very ſtrong, and the roſemary freſh; and if that be the caſe, the leaves are as proper as the flowers, which, according to the preſcription of ſome, ſhould only be taken. It is likewiſe neceſſary that the ſpirit of wine be diſtilled ſeveral times upon the roſemary; but that proceſs is too troubleſome and expenſive to admit of this water being diſpoſed of at the low price it is uſually ſold for; and it is certain, that the greater part of it is nothing elſe than common brandy, united with the eſſence of roſemary in the ſimpleſt manner. In general, it is only mixed with a few drops of the oil. For a long time paſt, this article has been brought to us principally from France, where it is prepared, particularly at Beaucaire, Montpellier, and other places in Languedoc, in which that plant grows in great abundance.

Hiſt. of Inventions.

The name Hungary water ſeems to ſignify, that this water, ſo celebrated for its medicinal virtues is an Hungarian invention; and we read in many books, that the receipt for preparing it was given to a queen of Hungary by a hermit; or, as others ſay, by an angel, who appeared to her in a garden, all entrance to which was ſhut, in the form of a hermit or a youth. Some call the queen St Iſabella; but thoſe who pretend to be beſt acquainted with the circumſtance affirm, that Elizabeth, wife of Charles Robert king of Hungary, and daughter of Uladiſlaus II. king of Poland, who died in 1380 or 1381, was the inventreſs. By often waſhing with this ſpirit of roſemary, when in the 70th year of her age, ſhe was cured, as we are told, of the gout and an univerſal lameneſs; ſo that ſhe not only lived to paſs 80, but became ſo lively and beautiful, that ſhe was courted by the king of Poland, who was then a widower, and who wiſhed to make her his ſecond wife.

The Profeſſor juſtly conſiders this ſtory as a ridiculous fable (A). " It appears to me (ſays he) moſt probable, that the French name *l'eau de la reine d' Hongrie*, was choſen by thoſe who, in latter times, prepared ſpirit of roſemary for ſale, in order to give greater conſequence and credit to their commodity; as various medicines

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(A) It was firſt publiſhed to the world in 1659 in a poſthumous work of John Prevot, who ſays that in the beginning of a very old breviary, he ſaw a remedy for the gout, written by the queen's own hand, in the following words:

" I Elizabeth, queen of Hungary, being very infirm and much troubled with the gout in the 72d year of my age, uſed for a year this receipt, given to me by an ancient hermit, whom I never ſaw before nor ſince; and was not only cured, but recovered my ſtrength, and appeared to all ſo remarkably beautiful, that the king of Poland aſked me in marriage, he being a widower and I a widow. I, however, refuſed him for the love of my Lord Jeſus Chriſt, from one of whoſe angels, I believe, I received the remedy. The receipt is as follows:

" R. Take of aqua vitæ, four times diſtilled, three parts, and of the tops and flowers of roſemary two parts: put theſe together in a cloſe veſſel, let them ſtand in a gentle heat 50 hours, and then diſtil them. Take one dram of this in the morning once every week, either in your food or drink, and let your face and the diſeaſed limb be waſhed with it every morning.

" It renovates the ſtrength, brightens the ſpirits, purifies the marrow and nerves, reſtores and preſerves the ſight, and prolongs life." Thus far from the Breviary. Then follows a confirmation which Prevot gives from his own experience.

dicines, ſome years ago, were extolled in the gazettes under the title of Pompadour, though the celebrated lady, from whoſe name they derived their importance, certainly neither ever ſaw them nor uſed them."

HUNGERFORD, a townſhip in Franklin county, Vermont, containing 40 inhabitants, 7 miles ſouth of the Canada line and 14 eaſt of Lake Champlain.—*Morſe.*

HUNGER CREEK, a ſtream which carries the various water machinery, in the new and thriving manufacturing town of Hamilton, between Albany and Schenectady, New-York.—*ib.*

HUNTER (John), the celebrated ſurgeon, was the youngeſt child of John Hunter of Kilbride, in the county of Lanark. He was born on the 14th of July 1728, at Long Calderwood, a ſmall eſtate belonging to the family; and loſing his father when he was about ten years of age, he was, perhaps, too much indulged by his mother. One conſequence of this was, that at the grammar-ſchool he made no progreſs in learning; and he may be ſaid to have been almoſt totally illiterate when, in September 1748, he arrived in London. His brother, Dr William Hunter, of whom an account is given in the *Encyclopædia*, was then the moſt celebrated teacher of anatomy, and John had expreſſed a deſire to aſſiſt him in his reſearches. The Doctor, who was very deſirous to ſerve him, and anxious to form ſome opinion of his talents for anatomy, gave him an arm to diſſect for the muſcles, with the neceſſary directions how it was to be done; and he found the performance ſuch as greatly exceeded his expectation.

His firſt eſſay in anatomy having thus gained him ſome credit, Mr Hunter was now employed in a diſſection of a more difficult nature; this was an arm in which all the arteries were injected, and theſe, as well as the muſcles, were to be expoſed and preſerved. The manner in which this was performed, gave Dr Hunter ſo much ſatisfaction, that he did not ſcruple to ſay, that his brother would become a good anatomiſt, and that he ſhould not want for employment. From this period we may conſider Mr Hunter as having ſeriouſly engaged in anatomy; and under the inſtructions of Dr Hunter, and his aſſiſtant Mr Symonds, he had every opportunity of improvement, as all the diſſections at this time carried on in London were confined to that ſchool.

In the ſummer 1749, Mr Cheſelden, at the requeſt of Dr Hunter, permitted him to attend at Chelſea Hoſpital; and he there learned the firſt rudiments of ſurgery.

The following winter he was ſo far advanced in the knowledge of human anatomy, as to inſtruct the pupils in diſſection, to whom Dr Hunter had very little time to pay attention. This office, therefore, fell almoſt entirely upon him, and was his conſtant employment during the winter ſeaſon.

In the ſummer months of 1750, Mr Hunter attended the hoſpital at Chelſea; in 1751, he became a pupil at St Bartholomew's, and in the winter was preſent at operations occaſionally, whenever any thing extraordinary occurred. The following ſummer he went to Scotland; and in 1753 entered, it is difficult to conceive for what reaſon, as a gentleman commoner at St Mary hall, Oxford. In 1754 he became a ſurgeon's pupil at St George's hoſpital, where he continued during the ſummer months; and in 1756 was appointed houſe-ſurgeon.

In the winter 1755, Dr Hunter admitted him to a partnerſhip in his lectures, and a certain portion of the courſe was allotted to him; beſides which, he gave lectures when the Doctor was called away to attend his patients. Making anatomical preparations was at this time a new art, and very little known; every preparation, therefore, that was ſkilfully made, became an object of admiration; many were wanting for the uſe of the lectures; and the Doctor being himſelf an enthuſiaſt for the art, left no means untried to infuſe into his brother a love for his favourite purſuits. How well he ſucceeded, the collection afterwards made by Mr Hunter will ſufficiently evince.

Anatomy ſeems to have been a purſuit for which Mr Hunter's mind was peculiarly fitted, and he applied to it with an ardour and perſeverance of which there is hardly any example. His labours were ſo uſeful to his brother's collection, and ſo gratifying to his diſpoſition, that although in many other reſpects they did not agree, this ſimple tie kept them together for many years.

Mr Hunter worked for ten years on human anatomy, during which period he made himſelf maſter of what was already known, as well as made ſome addition to that knowledge. He traced the ramifications of the olfactory nerves upon the membranes of the noſe, and diſcovered the courſe of ſome of the branches of the fifth pair of nerves. In the gravid uterus, he traced the arteries of the uterus to their termination in the placenta. He was alſo the firſt who diſcovered the exiſtence of the lymphatic veſſels in birds.

Many parts of the human body being ſo complex, that their ſtructure could not be underſtood, nor their uſes aſcertained, Mr Hunter was led to examine ſimilar parts in other animals, in which the ſtructure was more ſimple, and more within the reach of inveſtigation; this carried him into a wide field, and laid the foundation of his collection in comparative anatomy.

In this new line of purſuit, this active inquirer began with the more common animals, and preſerved ſuch parts as appeared by their analogy, or in ſome other way, to elucidate the human economy. It was not his intention to make diſſections of particular animals, but to inſtitute an inquiry into the various organizations by which the functions of life are performed, that he might thereby acquire ſome knowledge of general principles.

So eagerly did Mr Hunter attach himſelf to comparative anatomy, that he ſought by every means in his power the opportunities of proſecuting it with advantage. He applied to the keeper of wild beaſts in the Tower for the bodies of thoſe which died there; and he made ſimilar applications to the men who ſhowed wild beaſts. He purchaſed all rare animals which came in his way; and theſe, with ſuch others as were preſented to him by his friends, he entruſted to the ſhowmen to keep till they died, the better to encourage them to aſſiſt him in his labours.

His health was ſo much impaired by exceſſive attention to his purſuits, that in the year 1760 he was adviſed to go abroad, having complaints in his breaſt, which threatened to be conſumptive. In October of that year, Mr Adair, inſpector-general of hoſpitals, appointed him a ſurgeon on the ſtaff; and in the following ſpring he went with the army to Belliſle, leaving Mr Hewſon to aſſiſt his brother during his abſence.

Mr Hunter ſerved, while the war continued, as ſenior ſurgeon on the ſtaff, both in Belliſle and Portugal, till the year 1763; and in that period acquired his knowledge of gun-ſhot wounds. On his return to England he ſettled in London; where, not finding the emoluments from his half-pay and private practice ſufficient to ſupport him, he taught practical anatomy and operative ſurgery for ſeveral winters. He returned alſo, with unabated ardour, to comparative anatomy; and as his experiments could not be carried on in a large town, he purchaſed for that purpoſe, about two miles from London, a piece of ground near Brompton, at a place called Earl's Court, on which he built a houſe. In the courſe of his inquiries, this excellent anatomiſt aſcertained the changes which animal and vegetable ſubſtances undergo in the ſtomach when acted on by the gaſtric juice; he diſcovered, by means of feeding young animals with madder (which tinges growing bones red), the mode in which a bone retains its ſhape during its growth; and explained the proceſs of exfoliation, by which a dead piece of bone is ſeparated from the living.

His fondneſs for animals made him keep ſeveral of different kinds in his houſe, which by attention he rendered familiar with him, and amuſed himſelf by obſerving their peculiar habits and inſtincts; but this familiarity was attended with conſiderable riſk, and ſometimes led him into ſituations of danger, of which the following is a remarkable inſtance:

Two leopards, which were kept chained in an outhouſe, had broken from their confinement, and got into the yard among ſome dogs, which they immediately attacked; the howling this produced alarmed the whole neighbourhood; Mr Hunter ran into the yard to ſee what was the matter, and found one of them getting up the wall to make his eſcape, the other ſurrounded by the dogs; he immediately laid hold of them both, and carried them back to their den; but as ſoon as they were ſecured, and he had time to reflect upon the riſk of his own ſituation, he was ſo much agitated, that he was in danger of fainting.

On the fifth of February 1767, he was choſen a fellow of the Royal Society. His deſire for improvement in thoſe branches of knowledge which might aſſiſt in his reſearches, led him at this time to propoſe to Dr George Fordyce and Mr Cumming, an eminent mechanic, that they ſhould adjourn from the meetings of the Royal Society to ſome coffee-houſe, and diſcuſs ſuch ſubjects as were connected with ſcience. This plan was no ſooner eſtabliſhed, than they found their numbers increaſed; they were joined by Sir Joſeph Banks, Dr Solander, Dr Maſkelyne, Sir George Shuckburgh, Sir Harry Englefield, Sir Charles Blagden, Dr Noothe, Mr Ramſden, Mr Watt of Birmingham, and many others. At theſe meetings diſcoveries and improvements in different branches of philoſophy were the objects of their conſideration; and the works of the members were read over and criticiſed before they were given to the public. It was in this year that, by an exertion in dancing, after the muſcles of the leg were fatigued, he broke his tendo achillis. This accident, and the confinement in conſequence of it, led him to pay attention to the ſubject of broken tendons, and to make a ſeries of experiments to aſcertain the mode of their union.

In the year 1768, Mr Hunter became a member of the corporation of ſurgeons; and in the year following, through his brother's intereſt, he was elected one of the ſurgeons of St George's hoſpital. In May 1771, his treatiſe on the Natural Hiſtory of the Teeth was publiſhed; and in July of the ſame year he married Miſs Home, the eldeſt daughter of Mr Home, ſurgeon to Burgoyne's regiment of light horſe. The expence of his purſuits had been ſo great, that it was not till ſeveral years after his firſt engagement with this lady that his affairs could be ſufficiently arranged to admit of his marrying.

Though after his marriage his private practice and profeſſional character advanced rapidly, and though his family began to increaſe, he ſtill devoted much of his time to the forming of his collection, which, as it daily became larger, was alſo attended with greater expence. The whole ſuit of the beſt rooms in his houſe were occupied by his preparations; and he dedicated his mornings, from ſunriſe to eight o'clock (the hour for breakfaſt), entirely to his purſuits. To theſe he added ſuch parts of the day as were not engaged in attending his patients.

The knowledge he derived from his favourite ſtudies he conſtantly applied to the improvement of the art of ſurgery, and omitted no opportunity of examining morbid bodies; from which he made a collection of facts which are invaluable, as they tend to explain the real cauſes of ſymptoms, which during life could not be exactly aſcertained, the judgment of the practitioner being too frequently miſled by theoretical opinions, and deluſive ſenſations of the patients.

In the practice of ſurgery, where caſes occurred in which the operations proved inadequate to their intention, he always inveſtigated, with uncommon care, the cauſes of that want of ſucceſs; and in this way detected many fallacies, as well as made ſome important diſcoveries, in the healing art. He detected the cauſe of failure, common to all the operations in uſe for the radical cure of the hydrocele, and was enabled to propoſe a mode of operating, in which that event can with certainty be avoided. He aſcertained, by experiments and obſervations, that expoſure to atmoſpherical air ſimply, can neither produce nor increaſe inflammation. He diſcovered in the blood ſo many phenomena connected with life, and not to be referred to any other cauſe, that he conſidered it as alive in its fluid ſtate. He improved the operation for the fiſtula lachrymalis, by removing a circular portion of the os unguis inſtead of breaking it down with the point of a trochar. He alſo diſcovered that the gaſtric juice had a power when the ſtomach was dead of diſſolving it; and gave to the Royal Society a paper on this ſubject, which is publiſhed in the Philoſophical Tranſactions.

In the winter 1773, he formed a plan of giving a courſe of lectures on the theory and principles of ſurgery, with a view of laying before the public his own opinions upon that ſubject. For two winters he read his lectures *gratis* to the pupils of St George's Hoſpital; and in 1775, gave a courſe for money upon the ſame terms as the other teachers in the different branches of medicine and ſurgery. But giving lectures was always particularly unpleaſant to him; ſo that the deſire of ſubmitting his opinions to the world, and learning their general eſtimation, were ſcarcely ſufficient to overcome his natural diſlike to ſpeaking in public. He never gave the firſt lecture of his courſe without taking 30 drops of laudanum to take off the effects of his uneaſineſs.

Comparative anatomy may be conſidered as the purſuit in which Mr Hunter was conſtantly employed. No opportunity eſcaped him. In the year 1773, at the requeſt of his friend Mr Walſh, he diſſected the torpedo, and laid before the Royal Society an account of its electrical organs. A young elephant, which had been preſented to the Queen by Sir Robert Barker, died, and the body was given to Dr Hunter, which afforded Mr Hunter an opportunity of examining the ſtructure of that animal by aſſiſting his brother in the diſſection; ſince that time two other elephants died in the Queen's menagerie, both of which came under Mr Hunter's examination. In 1774, he publiſhed in the Philoſophical Tranſactions an account of certain receptacles of air in birds, which communicate with the lungs, and are lodged both among the fleſhy parts and hollow bones of theſe animals; and a paper on the Gillaroo trout, commonly called in Ireland the *Gizzardtrout*.

In 1775, ſeveral animals of that ſpecies, called the *gymnotus electricus of Surinam*, were brought alive to this country, and by their electrical properties excited very much the public attention. Mr Walſh, deſirous of purſuing his inveſtigations of animal electricity, made a number of experiments on the living animals; and to give his friend Mr Hunter an opportunity of examining them, purchaſed thoſe that died. An anatomical account of their electrical organs was drawn up by Mr Hunter, and publiſhed in the Philoſophical Tranſactions. In the ſame volume there is a paper of his, containing experiments on animals and vegetables reſpecting their power of producing heat.

In the courſe of his purſuits, Mr Hunter met with many parts of animals where natural appearances could not be preſerved, and others, in which the minuter veſſels could not be diſtinctly ſeen when kept in ſpirits; it was therefore neceſſary to have them drawn, either at the moment, or before they were put into bottles. The expence of employing profeſſed draughtſmen, the difficulty of procuring them, and the diſadvantage which they laboured under in being ignorant of the ſubject they were to repreſent, made him deſirous of having an able perſon in his houſe entirely for that purpoſe.

With this view he engaged an ingenious young artiſt to live with him for ten years; his time to be wholly employed as a draughtſman, and in making anatomical preparations. This gentleman, whoſe name was Bell, ſoon became a very good practical anatomiſt, and from that knowledge was enabled to give a ſpirited and accurate reſemblance of the ſubjects he drew, ſuch as is rarely to be met with in repreſentations of anatomical ſubjects. By his labours Mr Hunter's collection is enriched with a conſiderable number of very valuable drawings, and a great variety of curious and delicate anatomical preparations.

In January 1776, Mr Hunter was appointed ſurgeon extraordinary to his Majeſty; and in the ſpring he gave to the Royal Society a paper on the beſt mode of recovering drowned perſons.

In the autumn he was taken extremely ill, and the nature of his complaints made his friends, as well as himſelf, conſider his life to be in danger. When he reflected upon his own ſituation, that all his fortune had been expended in his purſuits, and that his family had no proviſion but what ſhould ariſe from the ſale of his collection, he became very ſolicitous to give it its full value, by leaving it in a ſtate of arrangement. This he accompliſhed with the aſſiſtance of Mr Bell and his brother-in-law Mr Home.

In 1778, he publiſhed the ſecond part of his Treatiſe on the Teeth, in which their diſeaſes, and the mode of treatment are conſidered. This rendered his work upon that ſubject complete. He publiſhed alſo in the Philoſophical Tranſactions a paper on the Heat of Animals and Vegetables. In 1779, he publiſhed his account of the Free Martin in the Philoſophical Tranſactions; and in 1780, he laid before the Royal Society an account of a woman who had the ſmall-pox during pregnancy, where the diſeaſe ſeemed to have been communicated to the fœtus.

In 1781, he was elected a fellow of the Royal Society of Sciences and Belles Lettres at Gottenburg. And in 1782, he gave the Royal Society a paper on the Organ of Hearing in Fiſh. Beſides the papers which he preſented to that learned body, he read ſix Croonion lectures upon the ſubject of Muſcular Action, for the years 1776, 1778, 1779, 1780, 1781, and 1782. In theſe lectures he collected all his obſervations upon muſcles, reſpecting their powers and effects, and the ſtimuli by which they are affected; and to theſe he added Comparative Obſervations upon the moving Powers of Plants.

Theſe lectures were not publiſhed in the Philoſophical Tranſactions, for they were withdrawn as ſoon as read, not being conſidered by the author as complete diſſertations, but rather as materials for ſome future publication.

It is much to be regretted (ſays Mr Home) that Mr Hunter was ſo tardy in giving his obſervations to the public; but ſuch was his turn for inveſtigation, and ſo extenſive the ſcale upon which he inſtituted his inquiries, that he always found ſomething more to be accompliſhed, and was unwilling to publiſh any thing which appeared to himſelf unfiniſhed. His obſervations on the Muſcular Action of the Blood-veſſels were laid before the Royal Society in 1780, and yet he delayed publiſhing them till his Obſervations on the Blood and Inflammation were arranged: and they make part of the volume which was publiſhed after his death.

In 1783, he was choſen into the Royal Society of Medicine and the Royal Academy of Surgery in Paris; and the ſame year the leaſe of the houſe which he occupied in Jermyn ſtreet having expired, he purchaſed the leaſe of a large houſe on the eaſt ſide of Leiceſter-ſquare, and the whole lot of ground adjoining to Caſtle-ſtreet, on which there was another houſe. In the middle ſpace between the two houſes, he erected, at the expence of L.3000, a building for his collection; though, unfortunately for his family, the leaſe did not extend beyond 24 years.

In the building formed for the collection there was a room fifty-two feet long, by twenty-eight feet wide, lighted from the top, and having a gallery all round, for containing his preparations. Under this were two apartments; one for his lectures, and the other, with no particular deſtination at firſt, but afterwards made uſe of for weekly meetings of medical friends during the winter. To this building the houſe in Caſtle-ſtreet was entirely ſubſervient; and the rooms in it were uſed for the different branches of human and comparative anatomy.

About this period Mr Hunter may be conſidered as at the height of his chirurgical career; his mind and body were both in their full vigour. His hands were capable of performing whatever was ſuggeſted by his mind; and his judgment was matured by former experience. Some inſtances of his extraordinary ſkill may very properly be mentioned.

He removed a tumor from the ſide of the head and neck of a patient at St George's Hoſpital, as large as the head to which it was attached; and by bringing the cut edges of the ſkin together, the whole was nearly healed by the firſt intention.

He diſſected out a tumor on the neck, which one of the beſt operating ſurgeons in this country had declared, rather too ſtrongly, that no one but a fool or a madman would attempt; and the patient got perfectly well.

He diſcovered a new mode of performing the operation for the popliteal aneuriſm, by taking up the femoral artery on the anterior part of the thigh without doing any thing to the tumor in the ham. The ſafety and efficacy of this mode have been confirmed by many ſubſequent trials; and it muſt be allowed to ſtand very high among the modern improvements in ſurgery.

If we conſider Mr Hunter at this period of his life, it will afford us a ſtrong picture of the turn of his mind, of his deſire to acquire knowledge, and his unremitting aſſiduity in proſecuting whatever was the object of his attention.

He was engaged in a very extenſive private practice; he was ſurgeon to St George's Hoſpital; he was giving a very long courſe of lectures in the winter; he was carrying on his inquiries in comparative anatomy; had a ſchool of practical human anatomy in his houſe; and was always employed in ſome experiments reſpecting the animal economy.

He was always ſolicitous for ſome improvement in medical education; and, with the aſſiſtance of Dr Fordyce, inſtituted a medical ſociety, which he allowed to meet in his lecture-rooms, and of which he was choſen one of the patrons. The ſociety, called the *Lyceum Medicum Londinenſe*, under his auſpices and thoſe of Dr Fordyce, has acquired conſiderable reputation, both from the numbers and merits of its members.

In the year 1786, in conſequence of the death of Mr Middleton, Mr Hunter was appointed deputy ſurgeon-general to the army. He now publiſhed his work upon the Venereal Diſeaſe, which had been long expected by the public; and, if we may judge from the rapid ſale of the firſt edition, theſe expectations have not been diſappointed. He alſo publiſhed a work entitled, Obſervations on certain Parts of the Animal Economy. In this work he has collected ſeveral of his papers inſerted in the Philoſophical Tranſactions, which related to that ſubject, having permiſſion from the preſident and council of the Royal Society to reprint them; there are alſo Obſervations upon ſome other Parts of the Animal Economy, which had not before been publiſhed. This work met with a very ready ſale.

In the year 1787, he gave a paper to the Royal Society, containing an Experiment to determine the effect of extirpating one Ovarium on the Number of Young; a paper in which the wolf, jackall, and dog, are proved to be of the ſame ſpecies; and a third upon the Anatomy of the Whale Tribe. Theſe papers procured him the honor of receiving Sir John Copley's annual gold medal, given as a mark of diſtinguiſhed abilities.

His collection, which had been the great object of his life, both as a purſuit and an amuſement, was now brought into a ſtate of arrangement; and gave him at length the ſatisfaction of ſhewing to the public a ſeries of anatomical facts formed into a ſyſtem by which the economy of animal life was illuſtrated. He ſhewed it to his friends and acquaintances twice a-year, in October to medical gentlemen, and in May to noblemen and gentlemen, who were only in town during the ſpring. This cuſtom he continued to his death.

Upon the death of Mr Adair, which happened in the year 1792, Mr Hunter was appointed inſpector general of hoſpitals, and ſurgeon general to the army. He was alſo elected a member of the Royal College of Surgeons in Ireland. In the year 1791, he was ſo much engaged in the duties of his office, as ſurgeon-general to the army, and his private practice, that he had little time to beſtow upon his ſcientifical objects; but his leiſure time, ſmall as it was, he wholly devoted to them.

In 1792, he was elected an honorary member of the Chirurgo-Phyſical Society of Edinburgh, and was choſen one of the vice-preſidents of the Veterinary College, then firſt eſtabliſhed in London. He publiſhed in the Tranſactions of the Society for the Improvement of medical and chirurgical Knowledge, of which ſociety he was one of the original members and a zealous promoter, three papers on the following ſubjects: Upon the Treatment of Inflamed Veins, on Introſuſception, and on a Mode of conveying Food into the Stomach in Caſes of Paralyſis of the Œſophagus.

He finiſhed his Obſervations on the Economy of Bees, and preſented them to the Royal Society. Theſe obſervations were made at Earl's Court, and had engaged his attention for many years; every inquiry into the economy of theſe inſects had been attended by almoſt unſurmountable difficulties; but theſe proved to him only an incitement, and the contrivances he made uſe of to bring the different operations of theſe indefatigable animals to view were almoſt without end.

Earl's Court to Mr Hunter was a retirement from the fatigues of his profeſſion; but in no reſpect a retreat from his labours; there, on the contrary, they were carried on with leſs interruption, and with an unwearied perſeverance. From the year 1772 till his death, he made it his cuſtom to ſleep there during the autumn months, coming to town only during the hours of buſineſs in the forenoon, and returning to dinner.

It was there he carried on his experiments on digeſtion, on exfoliation, on the tranſplanting of teeth into the combs of cocks, and all his other inveſtigations on the animal economy, as well in health as in diſeaſe. The common bee was not alone the ſubject of his obſervation, but the waſp, hornet, and the leſs known kinds of bees, were alſo objects of his attention. It was there he made the ſeries of preparations of the external and internal changes of the ſilk worm; alſo a ſeries of the incubation of the egg, with a very valuable ſet of drawings of the whole ſeries. The growth of vegetables was alſo a favourite ſubject of inquiry, and one on which he was always engaged in making experiments.

The collection of comparative anatomy which Mr Hunter has left, and which may be conſidered as the great object of his life, muſt be allowed to be a proof of talents, aſſiduity, and labour, which cannot be contemplated without ſurpriſe and admiration. It remains an unequivocal teſt of his perſeverance and abilities, and an honor to the country in whoſe ſchools he was educated, and by the patronage of which he was enabled on ſo extenſive a ſcale to carry on his purſuits. In this collection we find an attempt to expoſe to view the gradations of Nature, from the moſt ſimple ſtate in which life is found to exiſt, up to the moſt perfect and moſt complex of the animal creation—man himſelf.

By the powers of his art, this collector has been enabled ſo to expoſe, and preſerve in ſpirits or in a dried ſtate, the different parts of animal bodies intended for ſimilar uſes, that the various links of the chain of perfection are readily followed and may be clearly underſtood.

This collection of anatomical facts is arranged according to the ſubjects they are intended to illuſtrate, which are placed in the following order: *Firſt*, Parts conſtructed for motion. *Secondly*, Parts eſſential to animals reſpecting their own internal economy. *Thirdly*, Parts ſuperadded for purpoſes connected with external objects. *Fourthly*, Parts for the propagation of the ſpecies and maintainance or ſupport of the young.

Mr Hunter was a very healthy man for the firſt forty years of his life; and, if we except an inflammation of his lungs in the year 1759, occaſioned moſt probably by his attention to anatomical purſuits, he had no complaint of any conſequence during that period. In the ſpring of 1769, in his forty-firſt year, he had a regular fit of the gout, which returned the three following ſprings, but not the fourth; and in the ſpring of 1773, having met with ſomething which very forcibly affected his mind, he was attacked at ten o'clock in the forenoon with a pain in the ſtomach, attended with all the ſymptoms of *angina pectoris*. In the life of him prefixed to his *Treatiſe on the Blood, Inflammation, and Gun-Shot Wounds*, the reader will find one of the moſt complete hiſtories of that diſeaſe upon record. Suffice it, in this place, to ſay, that for twenty years he was ſubject to frequent and ſevere attacks of it, which however did not, till a ſhort time before his death, either impair his judgment or render him incapable of performing operations in ſurgery. "In autumn 1790 (ſays Mr Home), and in the ſpring and autumn 1791, he had more ſevere attacks than during the other periods of the year, but of not more than a few hours duration: in the beginning of October 1792, one, at which I was preſent, was ſo violent that I thought he would have died. On October the 16th, 1793, when in his uſual ſtate of health, he went to St George's Hoſpital, and meeting with ſome things which irritated his mind, and not being perfectly maſter of the circumſtances, he withheld his ſentiments; in which ſtate of reſtraint he went into the next room, and turning round to Dr Robertſon, one of the phyſicians of the hoſpital, he gave a deep groan and dropt down dead; being then in his 65th year, the ſame age at which his brother Dr Hunter had died."

It is a curious circumſtance, that the firſt attack of theſe complaints was produced by an affection of the mind, and every future return of any conſequence aroſe from the ſame cauſe; and although bodily exerciſe, or diſtention of the ſtomach, brought on ſlighter affections, it ſtill required the mind to be affected to render them ſevere; and as his mind was irritated by trifles, theſe produced the moſt violent effects on the diſeaſe. His coachman being beyond his time, or a ſervant not attending to his directions, brought on the ſpaſms, while a real misfortune produced no effect.

Mr Hunter was of a ſhort ſtature, uncommonly ſtrong and active, very compactly made, and capable of great bodily exertion. His countenance was animated, open, and in the latter part of his life deeply impreſſed with thoughtfulneſs. When his print was ſhewn to Lavater, he ſaid, "That man thinks for himſelf." In his youth he was cheerful in his diſpoſition, and entered into youthful follies like others of the ſame age; but wine never agreed with his ſtomach; ſo that after ſome time he left it off altogether, and for the laſt twenty years drank nothing but water.

His temper was very warm and impatient, readily provoked, and, when irritated, not eaſily ſoothed. His diſpoſition was candid, and free from reſerve, even to a fault. He hated deceit; and as he was above every kind of artifice, he deteſted it in others, and too openly avowed his ſentiments. His mind was uncommonly active; it was naturally formed for inveſtigation, and that turn diſplayed itſelf on the moſt trivial occaſions, and always with mathematical exactneſs. What is curious, it fatigued him to be long in a mixed company which did not admit of connected converſation; more particularly during the laſt ten years of his life.

He required leſs relaxation than moſt other men; ſeldom ſleeping more than four hours in the night, but almoſt always nearly an hour after dinner; this, probably, aroſe from the natural turn of his mind being ſo much adapted to his own occupations, that they were in reality his amuſement, and therefore did not fatigue.

In private practice he was liberal, ſcrupulouſly honeſt in ſaying what was really his opinion of the caſe, and ready upon all occaſions to acknowledge his ignorance, whenever there was any thing which he did not underſtand.

In converſation, he ſpoke too freely, and ſometimes harſhly, of his contemporaries; but if he did not do juſtice to their undoubted merits, it aroſe not from envy, but from his thorough conviction that ſurgery was as yet in its infancy, and he himſelf a novice in his own art; and his anxiety to have it carried to perfection, made him think meanly and ill of every one whoſe exertions in that reſpect did not equal his own.

HUNTER FORT, 21 miles weſt of Schenectady, on the ſouth ſide of Mohawk river, at the mouth of Schohary Creek, over which a bridge is about to be built. Here is an old church built in the reign of queen Ann, and 3 or 4 houſes. At this place was the Old Mohawk town, which was abandoned by that nation as late as the ſpring of 1780. Theſe Indians had made conſiderable advances in civilization—could generally ſpeak the Engliſh language, and numbers of them made profeſſion of their faith in the Chriſtian religion. In the church which is now ſtanding, they uſed to attend public worſhip in the Epiſcopal form. Theſe Indians are now ſettled, a part of them on Grand river, a northern water of Lake Erie, and a part of them in another part of Upper Canada. None of this nation now remain in the United States. The father of the only remaining family was drowned in 1788.—*Morſe.*

HUNTERDON *County*, in New-Jerſey, is bounded N. by that of Morris, E. by Somerſet, S. E. by Burlington, S. W. and W. by Delaware river, which ſeparates it from the State of Pennſylvania, and N. W. by Suſſex county. It is about 40 miles long, and 32 broad, is divided into 10 townſhips, and contains 20,253 inhabitants, including 1,301 ſlaves. On the top of Muſkonetcong mountain in this county, is a noted medicinal ſpring, much reſorted to. It iſſues from the ſide of a mountain into an artificial reſervoir, for the accommodation of thoſe who wiſh to bathe in, as well as to drink, the waters. It is a ſtrong chalybeate. Trenton is the chief town.—*ib.*

HUNTERSTOWN, a village of Pennſylvania, ſituated in York county, 25 miles W. by S. of York-Town.—*ib.*

HUNTING-CREEK, in Virginia, runs eaſt into Patowmak river, at the ſouth corner of the territory of Columbia.—*ib.*

Hunting-Creek-Town, a village in the northern part of Dorcheſter county, Maryland; 14 miles N. N. W. of Vienna, 16 S. by W. of Denton, and 18 N. E. of Cambridge.—*ib.*

HUNTINGDON, an extenſive and mountainous county in Pennſylvania, bounded N. and N. W. by Lycoming county, E. and N. E. by Mifflin, S. E. by Franklin, S. and S. W. by Bedford and Somerſet, and weſt by Weſtmoreland. It is about 75 miles long and 39 broad; contains 1,432,960 acres of land, divided into 7 townſhips, which contain 7,565 inhabitants. Limeſtone, iron ore and lead are found here. A furnace and two forges manufacture conſiderable quantities of pig and bar iron, and hollow ware; large works have alſo been eſtabliſhed for manufacturing of lead. Chief town, Huntingdon.—*ib.*

Huntingdon, the capital of the above county, ſituated on the N. E. ſide of Juniatta river, and at the mouth of Standing Stone creek, 50 miles from the mouth of Juniatta, contains about 90 houſes, a court-houſe, and gaol. It is about 23 miles W. S. W. of Lewis Town, and 184 W. N. W. of Philadelphia.—*ib.*

Huntingdon, a poſt-town on the north ſide of Long Iſland, New-York, ſituated at the head of a bay in Suffolk county, which ſets up ſouth from the ſound, contains about 70 houſes, a Preſbyterian and Epiſcopal church. It is 38 miles E. by N. of New-York city. It is oppoſite to Norwalk in Connecticut, and contains 3,260 inhabitants; of theſe, 552 are electors, 213 ſlaves.—*ib.*

Huntingdon, a townſhip in York county, Pennſylvania.—*ib.*

HUNTINGTON, a townſhip in Fairfield county, Connecticut, ſeparated from Derby on the north-eaſt by Stratford river.—*ib.*

Hunting-Town, a village on the weſt ſide of Cheſapeak bay in Maryland, ſituated on the S. E. ſide of Hunting Creek, in Calvert county, 3 miles N. by W. of Prince Frederick, and 22 E. N. E. of Port Tobacco.—*ib.*

HUNTSBURG, a townſhip in Franklin county, in Vermont. It is ſituated on the Canada line, having 46 inhabitants.—*ib.*

HUNTSVILLE, a poſt-town in North-Carolina, 10 miles from Bethania, and 16 from Rockford.—*ib.*

HURLEY, a townſhip in Ulſter county, New-York, containing 847 inhabitants; of whom 116 are electors, and 245 ſlaves. The compact part contains about 30 houſes, ſituated on Eſopus Kill, about 5 miles from the weſt bank of Hudſon's river, and 100 north of New-York. The lands around it are low and fertile, but infeſted with wild onions.—*ib.*

HURON, one of the five principal northern lakes. It lies between 43° 30′, and 47° 30′ N. lat. and between 80° 45′, and 84° 45′ W. long. and is reckoned to be upwards of 1000 miles in circumference. The fiſh are of the ſame kind as in Lake Superior, and it communicates with that lake through the ſtraits of St. Marie on the N. W. with Michigan on the W. and with Erie on the S. It is of a triangular ſhape, and on the S. W. part is *Saguinum* or Sagana bay, 80 miles in length, and about 18 or 20 in breadth; the other moſt remarkable bay is *Thunder Bay.* On the banks of the lake are found amazing quantities of ſand cherries. The land bordering on the weſtern ſhore of the lake is greatly inferior in quality to that on Lake Erie. It is mixed with ſand and ſmall ſtones, and is principally covered with pines, birch, and ſome oaks; but a little diſtance from the lake the ſoil is very luxuriant. Twenty years ago, part of the Indian nations, called Chepaways and Ottawas, who inhabited round Saguinum bay and on the banks of the lake could furniſh 200 warriors; and thoſe of the latter nation, who lived on the E. ſide of Lake Michigan, 21 miles from Michillimakkinack could furniſh 200 warriors.—*ib.*

HURON, a ſmall river of the N. W. territory, which, after a courſe of 38 miles, falls into Lake St Clair from the N. W. Gnadenhuetten lies on this river. Alſo the name of another ſmall river in the ſame territory, which runs N. eaſtward into Lake Erie, 40 miles weſtward of Cayahoga, and 15 S. E. of the mouth of Sanduſky Lake.—*ib.*

HURTERS, in fortification, denote pieces of timber, about ſix inches ſquare, placed at the lower end of the platform, next to the parapet, to prevent the wheels of the gun-carriages from damaging the parapet.

HYDE, a maritime county in Newbern diſtrict, North-Carolina; bounded E. by the ocean, W. by Beaufort county, N. by Tyrrel, and S. by Carteret. It contains 4120 inhabitants, of whom 1048 are ſlaves.—*Morſe.*

HYCO-OTEE, or *Hycoo*, a ſmall river which empties into the Dan, about 4 miles above the mouth of Staunton river.—*ib.*

HYDESPARK, a townſhip in Orleans county, in Vermont, containing 43 inhabitants. It is 25 miles S. of the Canada line, and 126 north by eaſt of Bennington.—*ib.*

HYDROGRAPHICAL Charts or Maps, more uſually called ſea-charts, are projections of ſome part of the ſea, or coaſt, for the uſe of navigation. In theſe are laid down all the rhumbs or points of the compaſs, the meridians, parallels, &c. with the coaſts, capes, iſlands, rocks, ſhoals, ſhallows, &c. in their proper places, and proportions.

HYDROMETER, is an inſtrument, of which ſo much has been ſaid in the *Encycl.* under that title, and in the article Specific *Gravity*, that we certainly ſhould not again introduce it in this place, but to guard our readers againſt error, when ſtudying the works of the French chemiſts. Theſe gentlemen, who are ſo ſtrongly attached to every thing which is new, as to believe that their anceſtors have for ages been wandering in the mazes of ignorance, refer very frequently to the *peſe-liqueur* of Baumé; and as that inſtrument has never been generally uſed in this country, it becomes our duty to deſcribe its conſtruction.

Inſtead of adopting the ſimple method of immediate numerical reference to the denſity of water expreſſed by unity, as is done in all modern tables of ſpecific gravity, he had recourſe to a proceſs ſimilar to that of graduating the ſtems of thermometers from two fixed points. The firſt of theſe points was obtained by immerſing his inſtrument, which is the common areometer, conſiſting of a ball, ſtem, and counterpoiſe, in pure water. At that point of the ſtem which was interſected by the ſurface of the fluid, he marked *zero*, or the commencement of his graduations. In the next place, he provided a number of ſolutions of pure dry common ſalt in water: theſe ſolutions contained reſpectively one, two, three, four, &c. pounds of the ſalt; and in each ſolution the quantity of water was ſuch, as to make up the weight equal to one hundred pounds in the whole; ſo that in the ſolution containing one pound of ſalt, there were ninety-nine pounds of water; in the ſolution containing two pounds of ſalt, there were ninety-eight pounds of water, and ſo of the reſt. The inſtrument was then plunged in the firſt ſolution, in which of courſe it floated with a larger portion of the ſtem above the fluid, than when pure water was uſed. The fluid, by the interſection of its ſurface upon the ſtem, indicated the place for marking his firſt degree; the ſame operation repeated, with the fluid containing two pounds of ſalt, indicated the mark for the ſecond degree; the ſolution of three pounds afforded the third degree; and in this manner his enumeration was carried as far as fifteen degrees. The firſt fifteen degrees afterwards, applied with the compaſſes repeatedly along the ſtem, ſerved to extend the graduation as far as eighty degrees, if required.

This inſtrument, which is applicable to the admeaſurement of denſities exceeding that of pure water, is commonly diſtinguiſhed by the name of the *Hydrometer for ſalts*.

The hydrometer for ſpirits is conſtructed upon the ſame principle; but in this the counterpoiſe is ſo adjuſted, that moſt part of the ſtem riſes above the fluid when immerſed in pure water, and the graduations to expreſs inferior denſities are continued upwards. A ſolution of ten parts by weight of ſalt in ninety parts of pure water, affords the firſt point, or zero, upon the ſtem; and the mark indicated by pure water is called the tenth degree; whence, by equal diviſions, the remaining degrees are continued upwards upon the ſtem as far as the fiftieth degree.

Theſe experiments, in both caſes, are made at the tenth degree of Reaumur, which anſwers very nearly to fifty-five of Fahrenheit.

HYDRUS, or Water Serpent, one of the new ſouthern conſtellations, including only ten ſtars.

HYGROMETER, is an inſtrument of ſo much importance to the meteorologiſt, that it becomes us to give ſome account of every improvement of it which has fallen under our notice. In the *Encyclopædia*, the principles upon which hygrometers are conſtructed have been clearly ſtated, and the defects of each kind of hygrometer pointed out.

Inſtead of hairs or cat-gut, of which hygrometers of the firſt kind are commonly made, Caſſebois, a Benedictine monk at Mentz, propoſed to make ſuch hygrometers of the gut of a ſilk worm. When that inſect is ready to ſpin, there are found in it two veſſels proceeding from the head to the ſtomach, to which they adhere, and then bend towards the back, where they form a great many folds. The part of theſe veſſels next the ſtomach is of a cylindric form, and about a line in diameter. Theſe veſſels contain a gummy ſort of matter from which the worm ſpins its ſilk; and, though they are exceedingly tender, means have been deviſed to extract them from the inſect, and to prepare them for the above purpoſe. When the worm is about to ſpin, it is thrown into vinegar, and ſuffered to remain there twenty-four hours; during which time the vinegar is abſorbed into the body of the inſect, and coagulates its juices. The worm being then opened, both the veſſels, which have now acquired ſtrength, are extracted; and, on account of their pliability, are capable of conſiderable extenſion. That they may not, however, become too weak, they are ſtretched only to the length of about fifteen or twenty inches. It is obvious that they muſt be kept ſufficiently extended till they are completely dry. Before they attain to that ſtate, they muſt be freed, by means of the nail of the finger, from a ſlimy ſubſtance which adheres to them. Such a thread will ſuſtain a weight of ſix pounds without breaking, and may be uſed for an hygrometer in the ſame manner as cat-gut; but we confeſs that we do not clearly perceive its ſuperiority.

To an improvement of the hygrometer conſtructed on the third principle, ſtated in the *Encyclopædia*, M. Hochheimer was led in the following manner:

Mr Lowitz found at Dmitriewſk in Aſtracan, on the banks of the Wolga, a thin bluiſh kind of ſlate which attracted moiſture remarkably ſoon, but again ſuffered it as ſoon to eſcape. A plate of this ſlate weighed, when brought to a red heat, 175 grains, and, when ſaturated with water, 247: it had therefore imbibed, between complete dryneſs and the point of complete moiſture, 72 grains of water. Lowitz ſuſpended a round thin plate of this ſlate at the end of a very delicate balance, faſtened within a wooden frame, and ſuſpended at the other arm a chain of ſilver wire, the end of which was made faſt to a ſliding nut that moved up and down in a ſmall groove on the edge of one ſide of the frame. He determined, by trial, the poſition of the nut when the balance was in equilibrio and when it had ten degrees of over-weight, and divided the ſpace between theſe two points into ten equal parts, adding ſuch a number more of theſe parts as might be neceſſary. When the ſtone was ſuſpended from the one arm of the balance, and at the other a weight equal to 175 grains, or the weight of the ſtone when perfectly dry, the nut in the groove ſhewed the exceſs of weight in grains when it and the chain were ſo adjuſted that the balance ſtood in equilibrio. A particular apparatus on

Hygrometer.

the ſame principles as a vernier, applied to the nut, ſhewed the exceſs of weight to ten parts of a grain. Lowitz remarked that this hygrometer in continued wet weather gave a moiſture of more than 55 grains, and in a continued heat of 113 degrees of Fahrenheit only 1½ degree of moiſture.

The hygrometer thus invented by Lowitz was, however, attended with this fault, that it never threw off the moiſture in the ſame degree as the atmoſphere became drier. It was alſo ſometimes very deceitful, and announced moiſture when it ought to have indicated that dryneſs had again begun to take place in the atmoſphere. To avoid theſe inconveniencies, M. Hochheimer propoſes the following method:

1. Take a ſquare bar of ſteel about two lines in thickneſs, and from ten to twelve inches in length, and form it into a kind of balance, one arm of which ends in a ſcrew. On this ſcrew let there be ſcrewed a leaden bullet of a proper weight, inſtead of the common weights that are ſuſpended. 2. Take a glaſs plate about ten inches long, and ſeven inches in breadth, deſtroy its poliſh on both ſides, free it from all moiſture by rubbing it over with warm aſhes, ſuſpend it at the other end of the balance, and bring the balance into equilibrium by ſcrewing up or down the leaden bullet. 3. Mark now the place to which the leaden bullet is brought by the ſcrew, as accurately as poſſible, for the point of the greateſt dryneſs. 4. Then take away the glaſs plate from the balance, dip it completely in water, give it a ſhake that the drops may run off from it, and wipe them carefully from the edge. 5. Apply the glaſs plate thus moiſtened again to the balance, and bring the latter into equilibrium by ſcrewing the leaden bullet. Mark then the place at which the bullet ſtands as the higheſt degree of moiſture. 6. This apparatus is to be ſuſpended in a ſmall box of well dried wood, ſufficiently large to ſuffer the glaſs-plate to move up and down. An opening muſt be made in the lid, exactly of ſuch a ſize as to allow the tongue of the balance to move freely. Parallel to the tongue apply a graduated circle, divided into a number of degrees at pleaſure from the higheſt point of dryneſs to the higheſt degree of moiſture. The box muſt be pierced with ſmall holes on all the four ſides, to give a free paſſage to the air; and to prevent moiſture from penetrating into the wood by rain, when it may be requiſite to expoſe it at a window, it muſt either be lackered or painted. To ſave it at all times from rain, it may be covered, however, with a ſort of roof fitted to it in the moſt convenient manner. But all theſe external appendages may be improved or altered as may be found neceſſary.

Hyperbola, ‖ Hypotrachelion.

HYPEBOLA Deficient, is a curve having only one aſymptote, though two hyperbolic legs running out infinitely by the ſide of the aſymptote, but contrary ways.

HYPOTRACHELION, in Architecture, is uſed for a little frize in the Tuſcan and Doric capital, between the aſtragal and annulets; called alſo the colerin and gorgerin. The word is applied by ſome authors in a more general ſenſe, to the neck of any column, or that part of its capital below the aſtragal.

I.

Jacobins.

JACOBINS, in the language of the preſent day, is the name aſſumed, at the beginning of the French revolution, by a party in Paris, which was outrageouſly democratical, and fanatically impious. This party, which conſiſted of members of the National Aſſembly, and of others maintaining the ſame opinions and purſuing the ſame objects, formed itſelf into a club, and held its meetings in the hall belonging to the Jacobin friars, where meaſures were ſecretly concerted for exciting inſurrections, and over-awing at once the legiſlature and the king. The name of *Jacobin*, though it was derived from the hall where the club firſt met, has ſince been extended to all who are enemies to monarchy, ariſtocracy, and the Chriſtian religion; and who would have every man to be his own prieſt and his own lawgiver. Hence it is, that we have Jacobins in other countries as well as in France.

Of the proceedings of the French Jacobins, ſome account has been given, in the *Encyclopædia*, under the title Revolution, and the ſubject will be reſumed in this *Supplement* under the ſame title. The purpoſe of the preſent article is to trace the principles of the ſect from their ſource; for theſe principles are not of yeſterday.

"At its very firſt appearance, (ſays the Abbé Barruel), this ſect counted 300,000 adepts; and it was ſupported by two millions of men, ſcattered through France, armed with torches and pikes, and all the firebrands of the revolution." Such a wide ſpread conſpiracy could not be formed in an inſtant; and indeed this able writer has completely proved, that this ſect, with all its conſpiracies, is in itſelf no other than "the coalition of a triple ſect, of a triple conſpiracy, in which, long before the revolution, the overthrow of the altar, the ruin of the throne, and the diſſolution of all civil ſociety, had been debated and determined."

It is known to every ſcholar that there have been in all ages and countries men of letters and pretenders to letters who have endeavoured to ſignalize themſelves individually by writing againſt the religion of their country; but it was reſerved for the philoſophiſts (A) of France to enter into a combination for the expreſs purpoſe

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(A) This term was invented by Abbé Barruel, and we have adopted it, as denoting ſomething very different from the meaning of the word *philoſopher*.

purpoſe of eradicating from the human heart every religious ſentiment. The man to whom this idea firſt occurred was Voltaire ; who, daring to be jealous of his God, and being weary, as he ſaid himſelf, of hearing people repeat that twelve men were ſufficient to eſtabliſh Chriſtianity, reſolved to prove that one might be ſufficient to overthrow it. Full of this project, he ſwore, before the year 1730, to dedicate his life to its accompliſhment ; and for ſome time he flattered himſelf that he ſhould enjoy alone the glory of deſtroying the Chriſtian religion. He found, however, that aſſociates would be neceſſary ; and from the numerous tribe of his admirers and diſciples, he choſe D'Alembert and Diderot as the moſt proper perſons to co-operate with him in his deſigns. How admirably they were qualified to act the part aſſigned them, may be conceived from the life of Diderot in this *Supplement*. But Voltaire was not ſatisfied with their aid alone.

He contrived to embark in the ſame cauſe Frederic II. of Pruſſia, who wiſhed to be thought a philoſopher, and who of courſe deemed it expedient to talk and write againſt a religion which he had never ſtudied, and into the evidence of which he had probably never deigned to enquire. This royal adept was one of the moſt zealous of Voltaire's coadjutors, till he diſcovered that the philoſophiſts were waging war with the throne as well as with the altar. This indeed was not originally Voltaire's intention. He was vain ; he loved to be careſſed by the great ; and, in one word, he was, from natural diſpoſition, an ariſtocrate and admirer of royalty : But when he found that almoſt every ſovereign but Frederick diſapproved of his impious projects as ſoon *as he perceived their iſſue*, he determined to oppoſe all the governments on earth, rather than forfeit the glory with which he had flattered himſelf, of vanquiſhing Chriſt and his apoſtles in the field of controverſy.

He now ſet himſelf, with D'Alembert and Diderot, to excite univerſal diſcontent with the eſtabliſhed order of things. This was an employment entirely ſuited to their diſpoſition ; for not being in any ſenſe *great* themſelves (B), they wiſhed to pull all men down to their own level. How effectually they contrived to convert the *Encyclopædie* into an engine to ſerve their purpoſes, has been ſhown already ; but it was not their only nor their moſt powerful engine ; they formed ſecret ſocieties, aſſumed new names, and employed an enigmatical language. Thus, Frederic is called *Luc ;* D'Alembert, *Protagoras*, and ſometimes *Bertrand;* Voltaire, *Raton ;* and Diderot, *Platon*, or its anagram *Tonpla ;* while the general term for the conſpirators is *Cacoucc*. In their ſecret meetings they profeſſed to celebrate the myſteries of *Mythra ;* and their great object, as they profeſſed to one another, was to confound the *wretch*, meaning J— C—. Voltaire propoſed to eſtabliſh a colony of philoſophiſts at Cleves, who, protected by the king of Pruſſia, might publiſh their opinions without dread or danger ; and Frederic was diſpoſed to take them under his protection, till he diſcovered that their opinions were anarchical as well as impious, when he threw them off, and even wrote againſt them.

They contrived, however, to engage the miniſters of the court of France in their favour, by pretending to have nothing in view but the enlargement of ſcience, in works which ſpoke indeed reſpectfully of revelation, while every diſcovery which they brought forward was meant to undermine its very foundation. When the throne was to be attacked, and even when barefaced atheiſm was to be promulgated, a number of impious and licentious pamphlets were diſperſed, for ſome time none knew how, from a ſecret ſociety formed at the Hotel d'Holbach at Paris. Theſe were ſold for trifles, or diſtributed *gratis* to ſchoolmaſters, and others who were likely to circulate their contents. D'Alembert, Diderot, and Condorcet, who was now aſſociated with the other conſpirators, flattered the ambition of every man among the great, and eſpecially of the Duke d'Orleans, the richeſt ſubject in Europe, and a prince of the blood of France. The firſt and the laſt of theſe three adepts, had, by their mathematical knowledge, got ſuch an aſcendency in the Royal Academy of Sciences, that they could admit or exclude candidates as they knew them to be friendly or inimical to the projects of the conſpirators ; and they had contrived, by matchleſs addreſs and unwearied perſeverance, to fill almoſt all the ſeminaries of education with men of their own principles.

Thus was the public mind in France completely corrupted, when the maſon lodges, over which the infamous Orleans preſided, were viſited by a delegation from the German illuminati ; and nothing more was neceſſary to produce the ſect of *Jacobins*, by whoſe intrigues and influence, France, as M. Barruel expreſſes himſelf, has become a prey to every crime. It was by the machinations of this ſect that its ſoil was ſtained with the blood of its pontiffs and prieſts, its rich men and nobles; with the blood of every claſs of its citizens, without regard to rank, age or ſex. Theſe diſciples of Voltaire were the men who, after having made the unfortunate Louis, his queen and ſiſter, drink to the very dregs, the cup of outrage and ignominy during a long confinement, ſolemnly murdered them on a ſcaffold, proudly menacing all the ſovereigns of the earth with a ſimilar fate. Yet think not, indignant reader, that the ways of Providence are unequal. The nations of Europe were ripe for chaſtiſement, and that chaſtiſement theſe villains were employed to inflict : but their own puniſhment did not linger. Voltaire died in agonies of deſponding remorſe, which can be exceeded only by the torments of the damned. There is reaſon to believe that the end of D'Alembert and Diderot very much reſembled that of their leader ; while the more hardened adept, Condorcet, became his own executioner ; and the other chiefs of the rebellion have regularly inflicted vengeance on each other, every alteration of the French conſtitution (and theſe alterations have been many) being followed by the execution of thoſe by whom the government was previouſly adminiſtered.

(B) We do not by this mean to inſinuate that D'Alembert was not a man of ſcience. He was perhaps the only man of ſcience in that gang ; but he was a maſter of no ſcience but mathematics ; and his birth being obſcure, if not ſpurious, and abſtract mathematics not furniſhing ready acceſs to the great, his ideas, when compared with Voltaire's, were groveling, and (as M. Barruel ſays) he was afraid to be ſeen.

JAGHIRE, aſſignment made in Bengal by an Imperial grant upon the revenue of any diſtrict, to defray civil or military charges, penſions, gratuities, &c.

JAGHIREDER, the holder of a Jaghire.

St. JAGO, the largeſt and moſt populous of the Cape de Verde iſlands, of which ſome account has been given in the *Encyclopædia*, is repreſented by Sir George Staunton as liable to long and exceſſive droughts, for which no philoſophical cauſe can be aſſigned. When the embaſſy to China touched at it in the latter end of 1792, it was in a ſtate of abſolute famine. Little or no rain had fallen for about three years before. The rivers were almoſt all entirely dry. The ſurface of the earth was, in general, naked of any herbage. The greateſt part of the cattle had periſhed, not leſs through drought than want of food. Of the inhabitants, many had migrated, and many were famiſhed to death. Nor was this calamity peculiar to St Jago. All the iſlands of Cape de Verde were ſaid to have experienced the ſame long drought, and to be conſequently in a ſtate of ſimilar deſolation. Yet the frequent ſhowers which were obſerved by the firſt navigators who touched at St Jago, induced them to give to the iſland the name of *Pluvialis*; and no change had been obſerved in the ſteady current of wind, blowing from the eaſt, which is common to tropical climates.

"What were the uncommon circumſtances (ſays Sir George) that took place in the atmoſphere of that part of Africa to which the Cape de Verde Iſlands lie contiguous, or in the vaſt expanſe of continent extending to the eaſt behind it, and from which this direful effect muſt have proceeded (as they happened where no man of ſcience exiſted to obſerve or to record them), will therefore remain unknown. Nor is theory bold enough to ſupply the place of obſervation. Whatever was the cauſe which thus arreſted the bountiful hand of Nature, by drawing away the ſources of fertility, it was obſervable, that ſome few trees and plants perſevered to flouriſh with a luxuriance, indicating that they ſtill could extract from the arid earth whatever portion of humidity it was neceſſary to derive from thence for the purpoſe of vegetable life, though it was denied to others."

Beſide the trees of the palm kind, which are often found verdant amidſt burning ſands, nothing, for example, could be more rich in flavour, or abound more with milky, though corroſive juice, than the aſclepias gigantea (ſee Asclepias, *Encycl.*), growing plentifully, about ſeveral feet high, without culture, indeed, but undiſturbed, it being of no avail to cut it down in favour of plants that would be uſeful, but required the aid of more moiſture from the atmoſphere. The jatropha curcas, or phyſic nut tree, which the French Weſt Indians, with ſome propriety, call *bois immortel*, and plant, on that account, in the boundaries of their eſtates, appeared as if its perpetuity was not to be affected by any drought. Some indigo plants were ſtill cultivated with ſucceſs in ſhaded vales, together with a few cotton ſhrubs. Throughout the country ſome of thoſe ſpecies of the mimoſa, or ſenſitive plant, which grow into the ſize of trees, were moſt common, and did not appear to languiſh. In particular ſpots the annona, or ſugar apple tree was in perfect verdure. The boraſſus, or great fan palm, lifted, in a few places, its lofty head and ſpreading leaves, with undiminiſhed beauty. In a bottom, about a mile and a half behind the town of Praya, was ſtill growing, in a healthy ſtate, what may be called for ſize a phenomenon in vegetation, a tree known to botaniſts by the name of adanſonia, and in Engliſh called *monkey bread tree*. The natives of St Jago call it *kabiſera*; others baobab. Its trunk meaſured at the baſe no leſs than 56 feet in girth; but it ſoon divided into two great branches, one riſing perpendicularly, and meaſuring 42 feet in circumference. That of the other was about 26. By it ſtood another of the ſame ſpecies, whoſe ſingle trunk of 38 feet girth, attracted little notice from the vicinity of its huge companion.

But the annual produce of agriculture was ſcarcely to be found. The plains and fields, formerly productive of corn, ſugar-canes, or plantains, nouriſhed by regular falls of rain, now bore little ſemblance of vegetation. Yet in the ſmall number of plants which ſurvived the drought, were ſome which, from the ſpecimens ſent to Europe, were found to have been hitherto unknown. Vegetation quickly, indeed, revived wherever, through the ſoil, any moiſture could be conveyed.

Sir George repreſents Praya, the reſidence of the Portugueſe Viceroy, as a hamlet rather than a town. It conſiſts of about 100 very ſmall dwellings, one ſtory high, ſcattered on each ſide of the plain, which extended near a mile in length, and about the third of a mile in breadth; and fell off, all around, to the neighbouring valleys and to the ſea. Not being commanded by any neighbouring eminence, it was a ſituation capable of defence; the fort, however, or battery, was almoſt in ruins; and the few guns mounted on it were moſtly honey-combed, and placed on carriages which ſcarcely held together.

A party belonging to the embaſſy croſſed the country to the ruins of St Jago, the former capital of the iſland, ſituated in the bottom of a vale, through which ran a ſtream then both ſmall and ſluggiſh. On each ſide of that ſtream are the remains of dwellings of conſiderable ſolidity and ſize; and the fragments of glaſs luſtres, ſtill hanging from the ceilings of ſome of the principal apartments, denote the elegance or riches that were once diſplayed in this now deſerted place. Not above half a dozen families remain in it at preſent; the reſt abandoned it, or periſhed. Here was ſtill, however, an attempt at a ſlight manufactory of ſtriped cotton ſlips, the ſame as are made in the other parts of the iſland, for the uſe of the Africans on the main, who pay for them in ſlaves, elephants teeth, and that gum which is generally called arabic.

Amidſt the ruins of St Jago the party found a Portugueſe, to whom one of them was recommended, and who received them with the moſt cordial hoſpitality in his houſe, and treated them with every ſpecies of tropical fruits from his garden, lying on each ſide the river.

He had been a navigator; and informed them that the iſle of Brava, one of the Cape de Verde's, was a fitter and ſafer place for ſhips to call at for water and proviſions than the iſland of St Jago; that it had three harbours; one called Puerto Furno on the eaſt ſide of the iſland, from which veſſels muſt warp, or be towed out by boats; the Puerto Fajendago to the weſt; and the Puerto Ferreo to the ſouth, which was the beſt for large ſhips, and into which runs a ſmall river. In another of the Cape de Verde iſlands, called San Vicenté, he obſerved that there was alſo a large harbour on the north end, but that freſh water was at ſome diſtance from it: and there was likewiſe a good port at Bonaviſta. This information of the harbours in the iſle of Brava was confirmed by accounts given by others to Sir Eraſmus Gower, who recommends to make a trial of them.

JALOFFS, or YALOFFS, are an active, powerful, and warlike people, inhabiting great part of that tract of Africa which lies between the Senegal and the Mandingo ſtates on the Gambia (See MANDINGOES in this *Supplement*). Their noſes, ſays Mr Park, are not ſo much depreſſed, nor their lips ſo protuberant, as thoſe of the generality of Africans; and though their ſkin is of the deepeſt black, they are conſidered by the white traders as the moſt ſightly Negroes in that part of the continent where they live. They are divided into ſeveral independent ſtates or kingdoms, which are frequently at war with their neighbours or with each other. In their manners, ſuperſtitions, and government, they have a greater reſemblance to the Mandingoes than to any other nation; but excel them in the manufacture of cotton cloth, ſpinning the wool to a finer thread, weaving it in a broader loom, and dyeing it of a better colour. They make very good ſoap, by boiling ground nuts in water, and then adding a ley of wood aſhes. They likewiſe manufacture excellent iron, which they carry to Bondou to barter for ſalt. Their language is ſaid to be copious and ſignificant, and is often learned by Europeans trading to Senegal. From the names of their numerals, as given by Mr Park, it would appear that their numeration proceeds by *fives*, as ours does by *tens*.

Our author relates the event of a religious war, which, as it diſplays a generoſity of character very uncommon among ſavages, will afford pleaſure to the minds of many of our readers. Almami Abdulkader, ſovereign of a Mahomedan kingdom called Foota Torra, ſent to Damel, a king of the Jaloffs, an imperious meſſage, commanding him and his ſubjects to embrace inſtantly the faith of the prophet. The ambaſſador having got admiſſion to the preſence of Damel, ordered ſome Buſhreens (*i. e.* Mahomedan Negroes) who accompanied him, to preſent the emblems of his miſſion. Two knives were accordingly laid before the Jaloff prince, and the ambaſſador explained himſelf as follows:

" With this knife (ſaid he) Abdulkader will condeſcend to ſhave the head of Damel, if Damel will embrace the Mahomedan faith; and with this other knife Abdulkader will cut the throat of Damel, if Damel refuſes to embrace it: Take your choice."—Damel coolly told the ambaſſador that he had no choice to make: he neither choſe to have his head ſhaved, nor his throat cut. And with this anſwer the ambaſſador was civilly diſmiſſed.

Abdulkader took his meaſures accordingly; and with a powerful army invaded Damel's country. The inhabitants of the towns and villages filled up their wells, deſtroyed their proviſions, carried off their effects, and abandoned their dwellings, as he approached. By this means he was led on from place to place, until he had advanced three days journey into the country of the Jaloffs. He had, indeed, met with no oppoſition; but his army had ſuffered ſo much from the ſcarcity of water, that ſeveral of his men died by the way. This induced him to direct his march towards a watering place in the woods, where his men, having quenched their thirſt, and being overcome with fatigue, lay down careleſsly to ſleep among the buſhes. In this ſituation they were attacked by Damel before day-break, and completely routed. Many of them were trampled to death as they lay aſleep by the Jaloffs horſes; others were killed in attempting to make their eſcape; and a ſtill greater number were taken priſoners. Among the latter was Abdulkader himſelf. This ambitious or rather frantic prince, who, but a month before, had ſent the threatening meſſage to Damel, was now himſelf led into his preſence as a miſerable captive. The behaviour of Damel, on this occaſion, is never mentioned by the ſinging men* but in terms of the higheſt approbation; and it was, indeed, ſo extraordinary in an African prince, that the reader may find it difficult to give credit to the recital. When his royal priſoner was brought before him in irons, and thrown upon the ground, the magnanimous Damel, inſtead of ſetting his foot upon his neck, and ſtabbing him with his ſpear, according to the cuſtom in ſuch caſes, addreſſed him as follows: " Abdulkader, anſwer me this queſtion. If the chance of war had placed me in your ſituation, and you in mine, how would you have treated me?" " I would have thruſt my ſpear into your heart (returned Abdulkader with great firmneſs); and I know that a ſimilar fate awaits me." " Not ſo (ſaid Damel); my ſpear is indeed red with the blood of your ſubjects killed in battle, and I could now give it a deeper ſtain, by dipping it in your own; but this would not build up my towns, nor bring to life the thouſands who fell in the woods. I will not therefore kill you in cold blood, but I will retain you as my ſlave, until I perceive that your preſence in your own kingdom will be no longer dangerous to your neighbours; and then I will conſider of the proper way of diſpoſing of you." Abdulkader was accordingly retained, and worked as a ſlave for three months; at the end of which period, Damel liſtened to the ſolicitations of the inhabitants of Foota Torra, and reſtored to them their king. Strange as this ſtory may appear, Mr Park has no doubt of the truth of it. It was told to him at Malacotta by the Negroes; it was afterwards related to him by the Europeans on the Gambia; by ſome of the French at Goree; and confirmed by nine ſlaves, who were taken priſoners along with Abdulkader by the watering place in the woods, and carried in the ſame ſhip with him to the Weſt Indies.—Such generoſity as this reflects honour on human nature.

JARRA, is a town of conſiderable extent in the Mooriſh kingdom of Ludamar in Africa. The houſes are built of clay and ſtone intermixed, a kind of wall very common in many parts of Scotland, where clay is made to ſupply the place of mortar. The greater part of the inhabitants of Jarra are Negroes from the borders of the ſouthern ſtates, who prefer, ſays Mr Park, a precarious protection under the Moors, which they purchaſe by a tribute, to the being continually expoſed to their predatory hoſtilities. The tribute which they pay is conſiderable; and they manifeſt the moſt unlimited obedience and ſubmiſſion to their Mooriſh ſuperiors; by whom they are, in return, treated with the utmoſt indignity and contempt. The Moors in this, and the other ſtates adjoining the country of the Negroes, reſemble in their perſons the Mulattoes of the

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* *The hiſtorians of the country.*

Weſt Indies, and ſeem to be a mixed race between the Moors, properly ſo called, of the north, and the Negroes of the ſouth; poſſeſſing many of the worſt qualities of both nations. Jarra is ſituated in 15° 5′ N. Lat. and 6° 48′ E. Long.

IATA, a bay on the coaſt of Chili.—*Morſe.*

IBBERVILLE, a river or rather a ſort of natural canal, of W. Florida, which, when the Miſſiſſippi overflows, and is high enough to run into it, (which is generally in the months of May, June, and July) forms a communication for veſſels drawing three or four feet, from the Miſſiſſippi to the gulf of Mexico, eaſtward, through the lakes Mauripas and Pontchartrain. This canal, which has been dignified with the name of river, is dry all the reſt of the year. It is a mile below a village of Alabama Indians, 35 miles from the ſettlements of Point Coupeé, 99 W. by N. of New-Orleans, 204 N. W. of the Balize, and 270 W. of Penſacola, by the above lakes. It receives the river Amit or Amite, from the northward, which is navigable for batteaux to a conſiderable diſtance.—*ib.*

IBIS. Under the generic name Tantalus (*Encycl.*), we have deſcribed, after Mr Bruce, a bird which he found in Abyſſinia, and concluded to be the ſacred ibis of ancient Egypt. M. Vaillant, during his laſt travels in Africa, found, in ſome lakes near the elephants river, a bird very different from Mr Bruce's, which he conſidered as belonging to the ſame ſpecies; and which he deſcribes thus: It is three feet in height. Its head and throat, which are extremely bare, are covered with a ſkin of the brighteſt red, terminated by a band of a beautiful orange, which ſeparates the naked part from that covered with feathers. The upper part of the wings, having broad ſtripes of a fine violet colour, agreeably ſhaded, is bordered by a white band of feathers, the thick and ſilky beards of which, ſeparated from each other, have a perfect reſemblance to a rich fringe. The quills of the wings and tail are of a greeniſh black, which, as it receives the light in a more or leſs oblique direction, aſſumes the appearance of violet or purple. The reſt of the plumage is of a beautiful white. The bill, which is long and ſomewhat crooked, is yellow; as are the feet. This bird belongs to the genus of the ibis, of which we are already acquainted with ſeveral ſpecies.

ICAQUE POINT, on the E. end of the iſland of St Domingo, lat. 19° 2′.—*Morſe.*

ICE-House. See that article, *Encyclopædia.* Profeſſor Beckmann, in the third volume of his Hiſtory of Inventions, has proved clearly that the ancients were well acquainted with what ſerved the purpoſe of ice-houſes.

"The art (ſays he) of preſerving ſnow for cooling liquors during the ſummer, in warm countries, was known in the earlieſt ages. This practice is mentioned by Solomon,* and proofs of it are ſo numerous in the works of the Greeks and the Romans, that it is unneceſſary for me to quote them, eſpecially as they have been collected by others. How the repoſitories for keeping it were conſtructed, we are not expreſsly told; but it is probable that the ſnow was preſerved in pits or trenches.

"When Alexander the Great beſieged the city of Petra, he cauſed 30 trenches to be dug, and filled with ſnow, which was covered with oak branches; and which kept in that manner for a long time. Plutarch ſays, that a covering of chaff and coarſe cloth is ſufficient; and at preſent a like method is purſued in Portugal. Where the ſnow has been collected in a deep gulph, ſome graſs or green ſods, covered with dung from the ſheep-pens, is thrown over it; and under theſe it is ſo well preſerved, that the whole ſummer through it is ſent the diſtance of 60 Spaniſh miles to Liſbon.

"When the ancients, therefore, wiſhed to have cooling liquors, they either drank the melted ſnow, or put ſome of it in their wine, or they placed jars filled with wine in the ſnow, and ſuffered it to cool there as long as they thought proper. That ice was alſo preſerved for the like purpoſe, is probable from the teſtimony of various authors; but it appears not to have been uſed ſo much in warm countries as in the northern. Even at preſent ſnow is employed in Italy, Spain, and Portugal; but in Perſia ice. I have never any where found an account of Grecian or Roman ice-houſes. By the writers on agriculture they are not mentioned."

ICHNOGRAPHY, in architecture, is a tranſverſe or horizontal ſection of a building, exhibiting the plot of the whole edifice, and of the ſeveral rooms and apartments in any ſtory; together with the thickneſs of the walls and partitions; the dimenſions of the doors, windows, and chimneys; the projectures of the columns and piers, with every thing viſible in ſuch a ſection.

ICHUA-TOWN, in the Geneſſee country in the State of New-York, is an Indian village at the mouth of Ichua Creek, a north-eaſtern head water of Alleghany river. It is 60 miles eaſterly of Fort Erie, 70 E. by S. of La Boeuf, and 67 S. W. by S. of Hartford on Geneſſee river.—*Morſe.*

ICUNADA DE BARRUGAN, a town on the river La Plata, in S. America.—*ib.*

ICY CAPE is the north-weſternmoſt head land of N. America, ſituated in the Northern ocean. Between this cape and Cape North, in Aſia, is the opening into Behring's Straits, which lead from the Northern into the Pacific ocean.—*ib.*

JEBB (John), was born in Southampton-ſtreet, Covent Garden, London on the 16th of February, 1736. He was the eldeſt ſon of the Rev. John Jebb, dean of Caſhel, in the kingdom of Ireland. He received the elements of his education in different ſchools, and was admitted, July 7, 1753, penſioner in the univerſity of Dublin, whence he removed, November the 9th 1754, to St Peter's college in Cambridge, where he was likewiſe a penſioner. In January 1757 he proceeded to the degree of A. B. and his place in the diſtribution of academical honours was, on that occaſion, ſecond wrangler, the late eminent mathematician Dr Waring being the firſt. In 1758 he obtained the ſecond prize of fifteen guineas, annually given by the univerſity to the authors of the beſt compoſitions in Latin proſe, being ſenior or middle bachelors of arts. Dr Roberts, afterwards provoſt of Eton college, obtained the firſt.

In the month of June 1760, Mr Jebb was admitted probationer fellow of St Peter's college, and proceeded to the degree of Maſter of Arts at the commencement in the ſame year; and on the firſt of July 1761, was confirmed fellow by Dr Mawſon, biſhop of Ely.

On the 6th of June 1762, he was ordained deacon at Bugden by Dr John Green, biſhop of Lincoln;

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* *Proverbs.* xxv. 15.

coln; and on the 25th of September, 1763, he was admitted by the ſame biſhop into prieſt's orders.

On the 22d of Auguſt, 1764, Mr Jebb was collated by Dr Matthias Mawſon, biſhop of Ely, to the ſmall vicarage of Gamlingay, near Potton, in Bedfordſhire, upon the recommendation of Dr Law, maſter of Peterhouſe. On the 17th of the following October, he was elected by the univerſity into the rectory of Ovington, near Watton, in Norfolk, after a competition with the Rev. Henry Turner, then fellow of St John's college, afterwards vicar of Burwell, in Cambridgeſhire. Upon caſting up the votes, there appeared to be for Mr Jebb 91, for Mr Turner 73; and accordingly he was inſtituted into the ſame the 15th of December following.

On the 29th of the ſame month, (December 1764) Mr Jebb married Anne, eldeſt daughter of the Rev. James Torkington, rector of Little Stukeley, in Huntingdonſhire, and of lady Dorothy Sherard, daughter of Philip, ſecond earl of Harborough.

Early in the year 1765, Mr Jebb, together with the Rev. Robert Thorpe, fellow of Peterhouſe, and the Rev. George Woolaſton, fellow of Sidney college, publiſhed, in a ſmall quarto, a comment on thoſe parts of Sir Iſaac Newton's *Principia* which more immediately relate to the ſyſtem of the world. The title of the joint work of theſe able and judicious philoſophers was, "Excerpta quædam e Newtoni principiis philoſophiæ naturalis, cum notis variorum." A work, of which the univerſity of Cambridge continues to bear teſtimony to the excellence, by the general uſe of it in the courſe of academical education.

Mr Chappelow profeſſor of Arabic, dying on the 14th of January 1768, Mr Jebb offered himſelf a candidate for the vacant chair; but it was given to Dr Hallifax, afterwards biſhop of Glouceſter; a man of deſerved celebrity, of whom we regret that it was not in our power to give a biographical ſketch.

On July 10. 1769, Mr Jebb was inſtituted to the vicarage of Flixton, near Bungay, in Suffolk, on the preſentation of William Adair, Eſq. of Flixton-hall; and on the 4th of April 1770, was inſtituted to the united rectories of Homersfield and St Croſs, pariſhes contiguous to Flixton, upon the ſame preſentation: being alſo, in the ſummer of the ſame year, nominated chaplain to Robert earl of Harborough. In conſequence of the acceſſion of theſe preferments, though not conſiderable in themſelves, he reſigned, ſome time in the month of October 1771, the rectory of Ovington, which he had received from the univerſity; and Mr Sheepſhanks, fellow of St John's college, was elected in his place.

Dr Hallifax ſucceeding to the profeſſorſhip of civil law, in the month of October 1770, upon the death of Dr Ridlington, Mr Jebb once more ſolicited that of Arabic, which Dr Hallifax then vacated: but he had by this time diſplayed ſuch an innovating ſpirit in religion, that the univerſity gave the vacant profeſſorſhip to Mr Craven, a man reſpected even by Mr Jebb and his friends.

Early in the year 1771, a deſign was formed of applying to parliament for relief in the matter of ſubſcription to the liturgy, and thirty-nine articles of the Church of England; and in the proſecution of this deſign Mr Jebb took a very active part. He attended different meetings of the diſcontented clergy, held at the Feathers tavern, London, aſſiſted in the drawing up of their petition, and wrote their circular letter, which gave to the public an account of their aims. He buſied himſelf at the ſame time in making various attempts to bring about what he called a reformation of the univerſity of Cambridge, but finding them fruitleſs, he retired, on the 25th of June 1772, to Bungay, where he ſtudied French and Italian, and proceeded in a plan of ſome *political* or *conſtitutional lectures*.

He had by this time ceaſed to read the prayers of the church, though he ſtill continued to preach occaſionally; and the Archdeacon of Suffolk, holding, this year, his uſual viſitation of ſome neighbouring pariſhes in the church of Flixton, Mr Jebb preached ſuch a ſermon againſt ſubſcription, as drew upon himſelf a public rebuke from the Archdeacon, in the preſence of the clergy. "Much altercation, (ſays he) enſued: and for ſome days I expected a ſummons to Norwich; but have heard no more of it. *I acted thus, with a view to call the attention of the Norwich clergy to our cauſe*; and have in part ſucceeded."

He acted much more honourably than this, when, in 1775, he reſigned all his preferments in the church: which ſurely he ought not to have retained one day after his conſcience would not permit him to read the prayers of the liturgy. He now reſolved to become a phyſician; and after attending St Bartholomew's hoſpital in London for ſix months, as the pupil of Dr William Pitcairn, he received, on the 18th of March 1777, a diploma of Doctor of Phyſic from the univerſity of St Andrews!! He did not, however, commence practice till the 5th of February 1778; and even then he continued to attend the lectures of Dr Hunter, Mr John Hunter, and Dr Higgins. On the 18th of February 1779 he was elected a Fellow of the Royal Society.

Dr Jebb, at the breaking out of the American war, had ſhewn himſelf at Cambridge a warm partizan of the revolting colonies; and of courſe a keen advocate for what he called, and, we doubt not, thought, the civil liberties of mankind. He now ſignalized himſelf by "An addreſs to the Freeholders of Middleſex," aſſembled at Free maſon's tavern in Great Queen-ſtreet, on Monday, December the 20th 1779, for the purpoſe of eſtabliſhing meetings to maintain and ſupport the freedom of election. Upon this occaſion, he communicated to James Townſend, Eſq. chairman of that meeting, the above addreſs, under the ſignature of "Salus Publica;" preſuming, that if the ſentiments "appeared to be founded in reaſon, they would not be the leſs regarded on account of their being ſuggeſted by an unknown individual."

This addreſs was immediately printed, and very ſoon paſſed through three editions, each being enlarged by the addition of freſh matter; and in 1782, followed the fourth edition corrected, which alſo bore our author's name in the title page.

About the end of February 1780, Dr Jebb was appointed by the committee of the county of Huntingdon, one of their deputies, to attend a meeting in London of repreſentatives from certain other petitioning counties, in order to concert meaſures for the more effectual reform of the preſent conſtitution of the houſe of commons. Soon afterwards he became one of the moſt active members of "the ſociety for conſtitutional information;" of which the object, according to their own account, was to diffuſe throughout the kingdom, as univerſally as poſſible, a knowledge of the great principles of conſtitutional freedom, particularly ſuch as reſpect the election and duration of the repreſentative body. "With this view (ſay they), conſtitutional tracts, intended for the extenſion of this knowledge, and to communicate it to perſons of all ranks, are printed and diſtributed gratis, at the expence of the ſociety. Eſſays, and extracts from various authors, calculated to promote the ſame deſign, are alſo publiſhed under the direction of the ſociety, in ſeveral of the newſpapers; and it is the wiſh of the ſociety to extend this knowledge throughout every part of the united kingdoms, and to convince men of all ranks, that it is their intereſt, as well as their duty, to ſupport a free conſtitution, and to maintain and aſſert thoſe common rights, which are eſſential to the dignity and to the happineſs of human nature." Could Dr Jebb have foreſeen all the miſchiefs which have flowed from this inſtitution; could he have foreſeen the wonderful ſpawn of factious ſocieties which have ſprung from it as from a parent ſtock, our veneration for genius and learning will not permit us to believe, that he would have neglected the ſtudies of his profeſſion for the ſake of taking the lead in party politics.

Dr Petit, one of the phyſicians of St Bartholomew's hoſpital, dying the 26th of May, Dr Jebb offered himſelf a candidate to ſucceed to that appointment. The election came on the 23d of June; when Dr Budd, his antagoniſt, ſucceeded by a great majority.

The oppoſition which was made to his election at St Bartholomew's, followed him in the winter, when he offered himſelf at St Thomas's hoſpital in the borough. Indeed he relinquiſhed his pretenſions there ſooner than in the former place; but for no other reaſon than becauſe he found that all his political principles were likely to be again objected to him, and to hazard his ſucceſs.

In the year 1783 he concurred with others in forming "the ſociety for promoting the knowledge of the ſcriptures," which met firſt on the 20th of September in that year, and whoſe meetings continued to be held, and, for ought we know to the contrary, are ſtill held at Eſſex houſe. The ſketch of their plan was chiefly written by Dr Jebb; and their object was to propagate the doctrines of Unitarianiſm, for which he was as great a zealot as for civil liberty.

His health now began to decline; but during his confinement, he ſtudied the Saxon language, the Anglo-Saxon laws, Engliſh hiſtory and antiquities, with a view to examine into our criminal code, and particular points of liberty. The vigour of his mind was ſtill equal to the furniſhing himſelf with this freſh ſtore of knowledge; he foreſaw the advantage of ſuch an acquiſition in the inveſtigation of the legal rights of Engliſhmen, and had deſigned to have employed it in the ſupport of ſome great conſtitutional queſtions, which he conſidered as eſſential to the freedom of his country.

But as the year began to dawn, it was very obſervable to many of his friends that, according to every appearance, and without ſome very great and ſingular effort of nature, his increaſed debility would defeat every exertion of the moſt judicious medical aſſiſtance, and terminate the remaining ſparks of human life.

In this enfeebled ſtate, his mind was active. His "Thoughts on Priſons" were printed and circulated in the county of Suffolk in 1785, by his much valued friend Mr Lofft; and there is ſufficient reaſon for concluding that this little tract had effect on the deliberations of the juſtices at Ipſwich and Bury, then engaged in erecting a new gaol for the diviſion of Ipſwich, and a new houſe of correction for that of Bury.

The good effects of this very excellent tract, it was apprehended, would be extended by a more general publication. In this hope Dr Jebb reviſed and corrected it with his dying hand: and his ſurviving friend publiſhed it ſoon after his death, adding thereto "an abſtract of felonies created by ſtatute and other articles relative to the penal law.

He continued to linger till May the 2d 1786, when, about 8 o'clock in the evening, he breathed his laſt, leaving behind him, among men of different perſuaſions, very different characters. By the diſſenters he is ſeldom mentioned but as the *Great Jebb;* by churchmen, his abilities are univerſally allowed, whilſt regret is expreſſed that they were ſo often employed in ſupport of faction and hereſy. His moral character has never been aſperſed.

JEFFERSONIA, a new plant lately diſcovered in Georgia by Dr Brickel of Savannah, and ſo named by him in compliment to the vice preſident of the United States. In the *Monthly Magazine* for July 1798 we have the following deſcription of it:

JEFFERSONIA pentandria monogynia.

Calyx, below, compoſed of five ſhort oval imbricated leaves; *corolla*, monophyllous, funnel ſhaped, on the receptacle, ſub-pentangular, bearing the filaments near the baſe, its margin hypocrateriform, divided into five round ducts nearly equal; *ſtyle*, piliform, ſhorter than the petal, but longer than the ſtamens; *ſtigma*, quadrifid; *anthers*, erect, linear, ſagittated; *fruit*, two univalved, carinated, polyſpermous capſules, united at the baſe, opening on their tops and contiguous ſides, having flat ſeeds, with a marginal wing.

Only one ſpecies is as yet diſcovered, *Jefferſonia ſempervirens.* It is a ſhrub with round poliſhed twining ſtems, which climb up on buſhes and ſmall trees; the petioles ſhort, oppoſite; leaves oblong, narrow, entire, evergreen, acute; flowers axillary, yellow, having a ſweet odour. The woods are full of this delightful ſhrub, which is covered with bloſſoms for many months in the year.

JERBOA, ſee MUS, *Encycl.* where deſcriptions are given of the jaculus or common jerboa, and of the Arabian, Egyptian, and Siberian jerboas. A variety of this animal has lately been found in Canada by Major-general Davies, F. R. S. and L. S. who ſays it belongs to Schreber's genus of Dipus, and may be thus characteriſed: DIPUS CANADENSIS *palmis tetradactylis, plantis pentadactylis, caudâ annulatâ undique ſetoſâ, corpore longiore.* The truth, however, ſeems to be, that it is only a variety, if indeed a variety, of the Siberian jerboa. The beautiful figure indeed given by General Davies of the Canadian jerboa differs in ſome reſpects from our figure of the Sibericus. Its ears lie flat and farther down the neck; its belly is not ſo large; its toes are longer: and it has no bruſh at the end of the tail; but the habits of the two animals ſeem to be the ſame. This

Jerboa.

Jerboa. || Jillifree.

will be apparent from the following extracts of the General's letter to the Linnean Society:

“ The firſt I was ſo fortunate to catch was taken in a large field near the falls of Montmorenci, and by its having ſtrayed too far from the ſkirts of the wood, allowed myſelf, with the aſſiſtance of three other gentlemen, to ſurround it, and after an hour's hard chaſe to get it unhurt, though not before it was thoroughly fatigued; which might in a great meaſure accelerate its death.

“ During the time the animal remained in its uſual vigour, its agility was incredible for ſo ſmall a creature. It always took progreſſive leaps of from three to four, and ſometimes of five yards, although ſeldom above 12 or 14 inches from the ſurface of the graſs; but I have frequently obſerved others in ſhrubby places and in the woods, amongſt plants, where they chiefly reſide, leap conſiderably higher. When found in ſuch places, it is impoſſible to take them, from their wonderful agility, and their evading all purſuit by bounding into the thickeſt cover they can find.”

That the Canadian, as well as the Siberian Jerboa ſleeps through the winter, ſeems evident from a ſpecimen having been found, towards the end of May, incloſed in a ball of clay, about the ſize of a cricket ball, nearly an inch in thickneſs, perfectly ſmooth within, and about twenty inches under ground. It was given to the General: who proceeds thus:

“ How long it had been under ground it is impoſſible to ſay; but as I never could obſerve theſe animals in any parts of the country after the beginning of September, I conceive they lay themſelves up ſome time in that month, or beginning of October, when the froſt becomes ſharp: nor did I ever ſee them again before the laſt week in May, or beginning of June. From their being enveloped in balls of clay, without any appearance of food, I conceive they ſleep during the winter, and remain for that term without ſuſtenance. As ſoon as I conveyed this ſpecimen to my houſe, I depoſited it, as it was, in a ſmall chip box, in ſome cotton, waiting with great anxiety for its waking; but that not taking place at the ſeaſon they generally appear, I kept it until I found it begin to ſmell: I then ſtuffed it, and preſerved it in its torpid poſition. I am led to believe, its not recovering from that ſtate aroſe from the heat of my room during the time it was in the box, a fire having been conſtantly burning in the ſtove, and which, in all probability was too great for reſpiration. I am led to this conception from my experience of the ſnow bird of that country, which always expires in a few days (after being caught, although it feeds perfectly well) if expoſed to the heat of a room with a fire or ſtove; but being nouriſhed with ſnow, and kept in a cold room or paſſage, will live to the middle of ſummer.”

Another variety of this ſpecies is deſcribed by Benjamin Smith Barton, M. D. Profeſſor of Botany and Natural Hiſtory, in the Univerſity of Pennſylvania, in the fourth volume of the Tranſactions of the American Philoſophical Society, p. 115 and 116. “ This animal,” ſays the Doctor, “ is about the ſize of the common houſe-mouſe. I weighed two of them. The difference in their weight was very ſmall. That of which I have given a figure, and from which the following deſcription is principally taken, weighed nine penny-weights, and twenty-two grains, ſoon after the death of the animal, and before the bowels were taken out. Like all the other ſpecies of Dipus, this is furniſhed with two *dentes primores*, or cutting teeth, in each jaw. Theſe teeth are ſharp at the points, and of a cheſnut-brown colour. The upper-jaw projects conſiderably beyond the lower. The noſtrils are open. The whiſkers are long. The ears are ſmall, ſomewhat oval, and covered. The fore-feet, or rather arms, are ſhort, and are furniſhed with four toes or fingers, the nails of which are long, and very ſharp. Beſides theſe fingers, there is a kind of minute tuberculum, in place of a thumb. This tuberculum is entirely deſtitute of a nail. The hind legs are very long, and are furniſhed with five toes, the three middle ones being long, ſlender, and nearly of an equal length. The two ſide-toes are much ſhorter. The inner toe is the ſhorteſt of the five.

The head, the back, and the whole upper part of the body, are of a reddiſh-brown colour, ſomewhat inclining to yellow. The back is marked by a darker brown than the other parts. The whole under ſide of the body, beginning with the upper jaw, and ending at the anus, is of a cream colour; as are, likewiſe, the inſides of the fore-legs, or arms, and the inſides of the hind-legs.

A yellow ſtreak, or band, beginning near the lower part of the noſtrils, on each ſide, runs along the whole length of the head and neck, the upper and under ſide of the forelegs, from thence all along the body, terminating with the thighs, at the joint.

The tail is conſiderably longer than the body, gradually tapers from its origin, and is finely ciliated, or lightly covered with hairs, its whole length. It ends in a fine pencil of hairs. The upper ſide is of a ſlate-brown colour, the under ſide is of a yellowiſh-cream colour. It is compoſed of a great number of joints.

JETTE, the border made round the ſtilts under a pier, in certain old bridges, being the ſame with ſtarling; conſiſting of a ſtrong framing of timber filled with ſtones, chalk, &c. to preſerve the foundations of the piers from injury.

IGNACIO, St, a town in the eaſtern part of Peru, and on the N. ſide of Amazon river.—*Morſe*.

IGORNACHOIX, a bay in the iſland of Newfoundland, ſouthward of St John's Bay.—*ib*.

JILLIFREE is a town on the northern bank of the river Gambia, oppoſite to James's iſland, where the Engliſh had formerly a ſmall fort. The kingdom of Barra, in which it is ſituated, produces great plenty of the neceſſaries of life; but the chief trade of the inhabitants is in ſalt, which they carry up the river in canoes; and, in return, bring down Indian corn, cotton cloths, elephants teeth, ſmall quantities of gold duſt, &c. The number of canoes and people conſtantly employed in this trade, make the king of Barra (ſays Mr Park) more formidable to Europeans than any other chieftain on the river, and have encouraged him to eſtabliſh thoſe exorbitant duties, which traders of all nations are obliged to pay at entry, amounting nearly to L. 20 on every veſſel, great and ſmall. Theſe duties, or cuſtoms, are generally collected in perſon by the alkaid or governor of Jillifree, who is attended by a numerous train of noiſy and troubleſome dependants, who, by their frequent intercourſe with the Engliſh, have acquired a ſmattering of our language, and beg for every thing which they fancy with ſuch earneſtneſs, that traders, in order to get quit of them, are frequently obliged to grant their requeſts. Lat. 13° 16′. Long. 16° 10′ eaſt from Greenwich.

ILEIGNES, or *St Charles*, a town on the S. ſide of the iſland of St Domingo, and 200 fathoms from the city of St Domingo. It is inhabited by emigrants from the Canary iſlands, and has a few ſtreets which run from the four cardinal points, and cut each other at right angles. The inhabitants are the moſt induſtrious people in the Spaniſh part of the iſland.—*Morse*.

ILHEOS, a captainſhip S. of that called Bay of All-Saints, and in the middle diviſion of Brazil. Chief town, Paya. Ilheos, the capital of the above province, ſtands about 30 leagues N. E. of Porto Segaro, and as far S. W. of the Bay of All-Saints. It is watered by a river of the ſame name, and contains about 200 families. S. lat. 15° 40′, W. long. 34° 28′.—*ib.*

ILLINOIS, a large navigable river of the N. W. Territory, formed by the confluence of the rivers Plein, and Theakiki, in 41° 48′ N. lat. and in 88° 42′ W. longitude. This noble branch of the Miſſiſſippi, after running a ſerpentine S. W. courſe, through an extenſive country of rich, fertile land, and receiving a vaſt number of rivers from 20 to 100 yards wide, which are navigable for boats from 15 to 180 miles, approaches within 5 miles of the Miſſiſſippi; from thence running eaſtward about 12 miles, it pays its tribute by a mouth 400 yards wide, in 38° 40′ N. lat. and in 92° 12′ W. longitude; oppoſite the large cave, 176 miles above the Ohio and 18 above the Miſſouri. The lands on the banks of the Illinois, particularly thoſe on the S. E. ſide, are perhaps as fertile as any part of North-America. They produce in the moſt luxuriant plenty, wheat, rye, Indian corn, peas, beans, flax, hemp, tobacco, hops, grapes, apples, pears, peaches, dyeing roots, medicinal plants, &c. Here alſo grow large foreſts of hickory, oak, cedar, mulberry trees, &c. Savannas, or natural meadows are both numerous and extenſive. In the foreſts are great variety of animals, as buffaloes, deer, &c. and in the rivers are plenty of fiſh, particularly cat, carp, and perch, of an enormous ſize. Such is the abundance of wild grapes in this country, that in the year 1769, the French planters upon this river made above 110 hhds. of ſtrong wine, from theſe grapes. On the north-weſtern ſide of this river is a coal mine, which extends for half a mile along the middle of its banks, and about the ſame diſtance below the coal mine are two ſalt ponds, 100 yards in circumference, and ſeveral feet in depth. The water is ſtagnant and of a yellowiſh colour; but the French and natives make good ſalt from it. The Illinois furniſhes a communication with lake Michigan, by Chicago river, between which and the Illinois are two portages the length of which do not exceed 4 miles. The whole length of the river from the ſource of Theakiki, which is but a ſhort diſtance from the river St Joſeph, oppoſite to Fort St Joſeph on the north, is 480 miles. The Indians have ceded to the United States, by the treaty of Greenville, in 1795, a tract of land 12 miles ſquare, at or near the mouth of the Illinois; alſo a tract 6 miles ſquare, at the Old Prarias fort and village near the ſouth end of Illinois Lake. That lake is only a dilatation of the river, and is ſituated about 240 miles below the ſource of Theakiki, and 43 below the Salt Ponds. It is 20 miles long and 5 miles broad in the middle.—*ib.*

Illinois *Indians* inhabit near Cahokia on the Miſſiſſippi. Warriors 260.—*ib.*

1 Object of the illuminati.

ILLUMINATI is the name which was aſſumed by a ſecret ſociety or order, founded on the firſt of May 1776, by Dr Adam Weiſhaupt profeſſor of canon law in the univerſity of Ingolſtadt. The real object of this order was, by clandeſtine arts, to overturn every government and every religion; to bring the ſciences of civil life into contempt; and to reduce mankind to that imaginary ſtate of Nature when they lived independent of each other on the ſpontaneous productions of the earth. Its avowed object, however, was very different. It profeſſed to diffuſe from ſecret ſocieties, as from ſo many centres, the light of ſcience over the world; to propagate the pureſt principles of virtue; and to re-inſtate mankind in the happineſs which they enjoyed during the golden age fabled by the poets. Such an object was well adapted to make a deep impreſſion on the ingenuous minds of youth; and to young men alone Weiſhaupt at firſt addreſſed himſelf.

It will naturally occur to the reader, that the means of attaining this glorious object ſhould have been made as public as poſſible; and that the veil of ſecrecy thrown over the proceedings of the order was calculated to excite ſuſpicion, and to keep even *young* men of virtue and ſagacity at a diſtance. In any other country than Germany ſecrecy might perhaps have had this effect; but various circumſtances conſpired there to make it operate with a powerful attraction.

Ever ſince free-maſonry had acquired ſuch reputation throughout Europe, a multitude of petty ſecret ſocieties had been formed in the univerſities of Germany, each having its lodge, its maſter, its myſteries, all modelled on thoſe founded by maſons coming from England and Scotland (A). Before the foundation of Weiſhaupt's order, theſe lodges, we believe, were in general harmleſs; or if they were productive of any evil, it was only by giving the youth of the univerſities a taſte for ſecrecy and myſticiſm. Of this Weiſhaupt availed himſelf; and as ſoon as he had conceived the outlines of his plan, and digeſted part of his ſyſtem, he initiated two of his own pupils, to whom he gave the names of

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(A) Such, we are ſorry to ſay, is the caſe ſtill. In a letter, dated the 10th of May 1799, which we received from a gentleman of learning and honour then reſiding in Upper Saxony, is the following account of the univerſity of Jena: "This univerſity contains from two to three thouſand ſtudents, who are almoſt all republicans, and go about the country in republican uniforms. They are all formed into clubs or *ſecret ſocieties;* and the quarrel of one member of a club is taken up by all. The conſequence is, that the number of duels among the different clubs is inconceiveable. The weapon is generally the ſabre, and the duel often ends in the death of one of the combatants." Yet gentlemen of Great Britain ſend their ſons to Germany to be educated!

of Ajax and Tiberius, aſſuming that of Spartacus to himſelf. Theſe two diſciples ſoon vying with their maſter in impiety (for it will be ſeen by and bye that he was moſt impious), he judged them worthy of being admitted to his myſteries, and conferred on them the higheſt degree which he had as yet invented. He called them *Areopagites*, denominated this monſtrous aſſociation, the order of illuminati, or illuminees, and inſtalled himſelf general of the order.

When public report ſpread the news in Germany of this new order having been founded in the univerſity of Ingolſtadt by Weiſhaupt, it was generally ſuppoſed to be one of thoſe little college-lodges which could not intereſt the adepts after they had finiſhed their ſtudies. Many even thought that Weiſhaupt, who was at that time a ſworn enemy to the Jeſuits, had founded this lodge with no other view than to form a party for himſelf againſt theſe fathers, who after the ſuppreſſion of their order, had been continued in their offices of public teachers at the univerſity of Ingolſtadt; and this opinion the illuminees were at pains to propagate. His character, too, was at this time ſuch as to remove every ſuſpicion from the public mind. A ſeeming aſſiduity in his duty, and a great ſhew of zeal and erudition in expounding the laws, eaſily miſled people to believe that his whole time and talents were engroſſed with the ſtudy of them; and if we are to credit his own account, Ingolſtadt had never witneſſed a profeſſor ſo well calculated to add new luſtre to its univerſity.

2
Art of the founder.

This ſeems, indeed, to have been the general opinion as well as his own; for, ſome time after the foundation of his order, he applied himſelf with ſuch diligence and apparent candour to the duties of his office, that he was choſen what Abbé Barruel's tranſlator calls superior of the univerſity. This new dignity only added to his hypocriſy, and furniſhed him with freſh means of carrying on his dark deſigns. He converted his houſe into one of thoſe boarding-houſes where young men, perpetually under the eye of their maſters, are ſuppoſed to be better preſerved than anywhere elſe from the dangers which threaten them at that age. He ſolicited fathers and mothers to entruſt their children to his care; and, counterbalancing in ſecret the leſſons which he was obliged to give in public, he ſent home his pupils well diſpoſed to continue the ſame career of ſeduction which he himſelf carried on at Ingolſtadt. Atrociouſly impious, we ſee him (ſays M. Barruel), in the firſt year of his illuminiſm, aping the God of Chriſtianity, and ordering *Ajax*, in the following terms, to propagate the doctrines of his new goſpel: "Did not Chriſt ſend his apoſtles to preach his goſpel to the univerſe? You that are my Peter, why ſhould you remain idle at home? Go then and preach."

Theſe preachers had yet received no particular deſignation; for when his firſt adepts were initiated, he was far from having completed the code of his order. He knew that years and experience were neceſſary to perfect that gradual ſyſtem of initiations and trials which, according to the plan he had conceived, his novices were to undergo; but he could not endure the idea of ſacrificing years to mere theoretic projects; and he flattered himſelf with the hopes of ſupplying the deficiencies of his incomplete code by proviſional regulations and private inſtructions, and of acquiring aſſociates who would receive his new goſpel implicitly, and co-operate with him in all his views.

3
The ſect divided into claſſes of

At length, however, the code was completed, and the ſect divided into two grand claſſes; and each of theſe again ſubdivided into leſſer degrees, proportioned to the progreſs of the adepts.

4
Preparation and

" The *firſt* claſs is that of Preparation. It contains four degrees, viz. thoſe of *Novice*, of *Minerval*, of *Minor Illuminee*, or *Illuminatus Minor*, and of *Major Illuminee*, or *Illuminatus Major*. To this claſs belong likewiſe ſome intermediary degrees, borrowed from free-maſonry, as means of propagation. Of the maſonic degrees, the code of the illuminati admits the firſt three without *any alteration*; but it adapts more particularly to the views of the ſect the degree of *Scotch Knight*, and ſtyles it the degree of *Directing Illuminee*, or *Illuminatus dirigens*.

5
The Myſteries.

The *ſecond* claſs is that of the Myſteries, which are ſubdivided into the *leſſer* and *greater myſteries*. The leſſer comprehend the prieſthood, and adminiſtration of the ſect, or the degrees of *prieſts*, and of *regents* or *princes*.

In the *greater myſteries* are comprehended the two degrees of *Magus*, or philoſopher, and of the *Man-king*. The *elect* of the latter compoſe *the council and degree of Areopagites*.

6
The recruiter,

" In all theſe claſſes, and in every degree (ſays the Abbé Barruel), there is an office of the utmoſt conſequence, and which is common to all the brethren. It is that which is occupied by him who is known in the code by the appellation of *Recruiter*, or *Brother Inſinuator*. This (continues our author) is not a term of my invention: it is really to be found in the code, and is the denomination of that illuminee whoſe employment is to entice members into the ſect."

As the whole ſtrength of the order depended upon the vigilant and ſucceſsful exerciſe of this office, ſome brethren were carefully inſtructed for it who might afterwards viſit the different towns, provinces and kingdoms, in order to propagate the doctrines of illuminiſm. Weiſhaupt propoſed to ſelect as his apoſtles either weak men who would implicitly obey his orders, or men of abilities, who would improve the office by artifices of their own. It was, however, a duty which every brother was obliged to exerciſe once or twice in his life, under the penalty of being for ever condemned to the lower degrees.

To ſtimulate the ardour of the brother inſinuator, he was appointed ſuperior over every novice whom he ſhould convert. To aſſiſt his judgment, he was inſtructed in three important points concerning the deſcription of men whom he ought to ſelect for converſion, the means which he ought to employ for enticing them to enter the order, and the arts which he ought to ſtudy to form their character.

7
To pry into the characters of all men.

To enable the recruiter to determine whom he ought to ſelect for converſion, he was to inſinuate himſelf into all companies; he was to pry into the character of all whom he ſhould meet with, whether friends, relations, ſtrangers or enemies; he was to write down all his remarks regularly every day; to point out their ſtrong and weak ſides, their paſſions and prejudices, their intimacies, their intereſts, and their fortune. This journal was to be tranſmitted twice every month to the ſuperiors; by which means the order would learn who were friendly or hoſtile to their views, and who were the individuals to whom they ought to direct their arts of ſeduction(B).

The perſons to be excluded were all ſuch as would expoſe the order to ſuſpicion or reproach. All indiſcreet talkers, all who were proved violent, and difficult to be managed, all addicted to drunkenneſs, and all Pagans, Jews, and Jeſuits, were to be rejected. As the patronage of princes would tend much to enrich and ſtrengthen the ſociety, it was agreed to admit them to the inferior degrees, but they were never to be initiated into the grand myſteries; they were never to riſe beyond the degree of Scotch knight.

8 Perſons proper for the order, The perſons to be ſelected were young men of all ſtations, from eighteen to thirty; but particularly thoſe whoſe education was not completed, and conſequently whoſe habits were not formed. “Seek me out (ſays Weiſhaupt in his directions to the inſinuator) the dexterous and daſhing youths. We muſt have adepts who are inſinuating, intriguing, full of reſource, bold and enterpriſing; they muſt alſo be flexible and tractable, obedient, docile, and ſociable.” In another place he ſays, “Above all things pay attention to the figure, and ſelect the well made men and handſome young fellows. They are generally of engaging manners and nice feelings. When properly formed, they are the beſt adapted for negociations; for firſt appearances prepoſſeſs in their favour. It is true, they have not the depth that men of more gloomy countenances often have. *They are not the perſons to be entruſted with a revolt, or the care of ſtirring up the people;* but it is for that very reaſon we muſt know how to chooſe our agents. I am particularly fond of thoſe men whoſe very ſoul is painted in their eyes, whoſe foreheads are high, and whoſe countenances are open. Above all, examine well the eyes, for they are the very mirrors of the heart and ſoul. Obſerve the look, the gait, the voice. Every external appearance leads us to diſtinguiſh thoſe who are fit for our ſchool.”

Though young men were preferred, yet perſons of all ages were to be admitted if their character accorded with the principles of the order. The inſinuator was deſired to ſeek out thoſe who were diſtinguiſhed by their power, riches, or learning. “Spare no pains (ſays Weiſhaupt), ſpare nothing in the acquiſition of ſuch adepts. If heaven refuſe its ſuccour, conjure hell.

Flectere ſi nequeas ſuperos, Acheronta moveto.”

9 To be ſeduced by whatever means; Perſons were to be ſingled out from thoſe profeſſions which give men influence over others, or put them in the moſt favourable ſituation for diſſeminating any peculiar opinions. With this view, ſchoolmaſters, and ſuperintendants of eccleſiaſtic ſeminaries, were to be ſought after with much care. Bookſellers, poſt-maſters, and the ſecretaries of poſt-offices were alſo to be ſelected. Thoſe profeſſions which accuſtomed men to ſpeak and argue, as that of counſellors and attorneys, and even phyſicians, were alſo to be courted. “They are worth having (ſays Weiſhaupt), but they are ſometimes real devils, ſo difficult are they to be led; they are, however, worth having when they can be gained over.” Every exertion was to be made to gain the officers of a prince, whether preſiding over provinces or attending him in his councils. “He that has done this, has done more than if he had engaged the prince himſelf.”

There was alſo another deſcription of men of whom Weiſhaupt very wiſely judged that they would be admirably fitted for the diffuſion of his doctines. Theſe were the diſappointed and diſſatiſfied. “Select thoſe in particular (ſays he) who have met with misfortunes, not from accidents, but from ſome injuſtice; that is to ſay, in other words, the diſcontented; for ſuch men are to be called into the boſom of illuminiſm as into their proper aſylum.”

10 And their characters tranſmitted to the ſuperiors. When the inſinuator has made choice of his victim, he is required to draw from his diary a view of his character, opinions, principles, and connections. This he is to tranſmit to the ſuperiors for their examination, and that they may compare it with the diaries which they have already received, perhaps from different inſinuators. When the choice of the inſinuator is approved, the ſuperiors determine which of the inſinuators will be beſt qualified to perform the taſk of ſeducing their candidate.

Two different methods were recommended; one of which

(B) As a ſpecimen of the journals kept by the inſinuators, and of the characters which the illuminees ſelected for propagating their principles, we ſhall give the character of Zwack, denominated *Cato*, as it is deſcribed in the tablet of his inſinuator Ajax (Maſſenhauſen).

“Francis Xaverius Zwack was ſon of Philip Zwack, commiſſary of the *Chambre des Comptes*, and was born at Ratiſbon; at the time of his initiation (29th May 1776) he was twenty years of age, and had finiſhed his college education.

“He was then about five feet high; his perſon emaciated with debauchery; his conſtitution bordering on melancholy; his eyes of a dirty grey, weak and languiſhing; his complexion pale and ſallow; his health weak, and much hurt by frequent diſorders; his noſe long, crooked and hooked; his hair light brown; gait precipitate; his eyes always caſt towards the ground; under the noſe and on each ſide of the mouth, a mole.

“His heart tender and philanthropic in an extraordinary degree; but ſtoic when in a melancholy mood; otherwiſe a true friend, circumſpect, reſerved, extremely ſecret; often ſpeaking advantageouſly of himſelf; envious of other people's perfections; voluptuous; endeavouring to improve himſelf; little calculated for numerous aſſemblies; choleric and violent, but eaſily appeaſed; willingly giving his private opinions when one has the precaution to praiſe him, though contradicting him; a lover of novelties. On religion and conſcience widely differing from the received ideas; and thinking preciſely as he ought, to become a good member of the order.

“His predominant paſſions are, pride, love of glory, probity; he is eaſily provoked; has an extraordinary propenſity for myſteries; a perpetual cuſtom of ſpeaking of himſelf and of his own perfections; he is alſo a perfect maſter in the arts of diſſimulation; a proper perſon to be received into the order, as applying himſelf particularly to the ſtudy of the human heart.” Such is the character of the beloved diſciple of Weiſhaupt, the incomparable Cato, and a leader of the ſect of the illuminees!

which was to be employed in enticing men who were ſomewhat advanced in life or diſtinguiſhed by ſcience; the other was to be uſed in ſeducing young men whoſe character was not formed.

11
Proper methods of ſeducing men of knowledge,

With men of knowledge, who had already imbibed the principles of modern philoſophiſm (for no true philoſophers were to be attempted), the inſinuator was to aſſume the character of a philoſopher well acquainted with the myſteries of ancient times. He was to deſcant upon the importance of the ſecret doctrines tranſmitted by tradition, to quote the gymnoſophiſts of India, the prieſts of Iſis in Egypt, and thoſe of Eleuſis, with the Pythagorean ſchool in Greece. He was to learn by heart certain paſſages from Iſocrates, Cicero, and Seneca, that he might have them ready upon all occaſions. He was to throw out hints, that theſe ſecret doctrines explained the difficult queſtions concerning the origin and order of the univerſe, the Providence of God, the nature of the ſoul, its immortality and future deſtination; he was to inſpire them with the belief that the knowledge of theſe things would render life more agreeable and pain more ſupportable, and would enlarge their ideas of the majeſty of God: he was then to declare that he had been initiated into theſe myſteries. If the candidate expreſſed any curioſity to be made acquainted with them, the inſinuator was firſt to aſcertain his opinions upon ſome leading points, by propoſing to him to write a diſſertation upon certain queſtions. Should the anſwers not pleaſe the inſinuator, he was to relinquiſh his prey; but ſhould they be ſatisfactory, the candidate was to be admitted to the firſt degree.

12
And young men,

When the ſelected victim was young, and had not imbibed any of thoſe opinions which correſponded with the principles of the ſect, a different method was to be followed. “Let your firſt care (ſays the legiſlator to his inſinuators) be to gain the affection, the confidence, and the eſteem of thoſe whom you are to entice into the order. Let your whole conduct be ſuch, that they ſhall ſurmiſe ſomething more in you than you wiſh to ſhew; hint, that you belong to ſome ſecret and powerful ſociety; excite by degrees, and not at once, a wiſh in your candidate to belong to a ſimilar ſociety. Certain arguments and certain books, which the inſinuator muſt have, will greatly contribute to raiſe ſuch a wiſh; ſuch, for example, are thoſe which treat of the union and ſtrength of aſſociations.”

Every inſinuator muſt be provided with books of this ſort. But that their ſucceſs might not depend ſolely upon books, Weiſhaupt gave to his diſciples a ſpecimen of the artifices which they might employ. The inſinuator might begin by obſerving, that a child in the cradle, abandoned to itſelf, is entirely helpleſs; and that it is by the aſſiſtance of others that it acquires ſtrength; and that princes owe their greatneſs and their power to the union of their ſubjects. Then the inſinuator might touch on the importance of knowing mankind, and the arts of governing them; that one man of parts might eaſily lead hundreds, even thouſands, if he but knew his advantages. He was next to dwell upon the defects of civil ſociety; to mention how little relief a man can obtain even from his beſt friends; and how very neceſſary it is for individuals to ſupport one another in theſe days: to add, that men would triumph even over heaven were they but united. He was to adduce as examples, the influence of the freemaſons and of the Jeſuits. He was to aſſert, that all the great events which take place in the world depend upon hidden cauſes, which theſe ſocieties powerfully influence. He was to awake in the breaſt of his pupil the deſire of reigning in ſecret; of preparing in his cloſet a new conſtitution for the world; and of governing thoſe who think they govern others.

13
Into the noviciate.

After theſe, or other artifices of the ſame kind, have been employed, if the candidate be inſpired with an ardour to be initiated, and give ſatisfactory anſwers to the queſtions propoſed to him, he is immediately admitted a novice. But ſhould he reject all means of ſeduction, let him take heed to himſelf; “for the vengeance of ſecret ſocieties is not a common vengeance; it is the hidden fire of wrath. It is irreconcileable; and ſcarcely ever does it ceaſe the purſuit of its victims until it has ſeen them immolated.”

14
Period of the noviciate.

The period of the noviciate varied according to the age of the new convert to illuminiſm. At firſt it continued three years for thoſe under eighteen years of age, two years for thoſe between eighteen and twenty-four, and one year for thoſe who were near thirty; but it was afterwards ſhortened.

The novice was not acquainted with any of the order except his inſinuator, under whoſe direction he remained during his noviciate. The firſt leſſons which he was taught reſpected the inviolable nature of the ſecrecy which every illuminee was obliged to obſerve. He was told that ſilence and ſecrecy were the very ſoul of the order; that ingenuouſneſs was a virtue only with reſpect to his ſuperiors; and that diſtruſt and reſerve were fundamental principles. He was enjoined never to ſpeak of any circumſtance relating to the order, concerning his own admiſſion, or the degree which he had received, not even before brethren, without the ſtrongeſt neceſſity; and was required to ſign a declaration to this purpoſe.

15
Dictionary, geography, calendar, and cypher of the order.

The novice was next taught the dictionary of the order, its geography, calendar, and cypher. To prevent the poſſibility of diſcovery, every illuminee received a new name, which was characteriſtic of his diſpoſitions, or of the ſervices which were expected of him. Thus Weiſhaupt, as we have obſerved, was called *Spartacus*, becauſe he pretended to wage war againſt thoſe oppreſſors who had reduced mankind to ſlavery; and Zwack, as we have ſeen, was named *Cato*, becauſe he had written a diſſertation in favour of ſuicide, and had once determined to commit that crime.

According to the new geography of the order, Bavaria was called *Achaia*; Munich was called *Athens*; Vienna was named *Rome*; Wurtzburgh was denominated *Carthage*; and Ingolſtadt, the fountain of the order, was called *Epheſus*, and by the profound adepts *Eleuſis*. The novice had alſo to learn the Perſian calendar, which the order had adopted. Their era began A. D. 630. The months received new names: May was called *Adarpahaſcht*; June, *Chardad*; July, *Thermeh*; Auguſt *Merdedmeh*; and ſo on. The cypher conſiſted of numbers which correſponded to the letters of the alphabet, in this order *a*, *b*, *c*, *d*, anſwering to the numbers 12, 11, 10, 9.

The novice had next to ſtudy *the ſtatutes of the illuminees*, which he was aſſured contained nothing injurious to the ſtate, to religion, or to good morals. He was next deſired to apply himſelf to acquire the morality of the order: which he was to do, not by reading the goſpels, but by peruſing Epictetus, Seneca, and Antoninus, and by ſtudying the works of the modern ſophiſts Weiland, Meiners, and Helvetius, &c. The ſtudy of man was alſo recommended as the moſt intereſting of all the ſciences. He was taught this ſtudy not merely as a ſcience, but as an art. A model of a journal was given him, and he was required to inſert in it obſervations upon the character of every perſon that he happened to meet with. To quicken his diligence, the inſinuator occaſionally examined his journal. In the mean time the inſinuator was watching him as a centinel, and noting down regularly obſervations upon the defects and merits of his pupil, which he always ſent to his ſuperiors.

16 Novice obliged to draw his own character.

The great object of the inſinuator was to entangle the novice, and to bind him indiſſolubly to the order. With this view he required the novice to draw a faithful picture of himſelf, under the pretence that he would thus know himſelf better. He deſired him to write down his name, his age, his country, his reſidence, and his employment ; to give a liſt of the books in his library ; to ſtate his revenue ; to enumerate his friends and enemies, and the cauſe of his enmities. He was alſo to give a ſimilar account of his father and mother, his brothers and ſiſters, and to be very careful in pointing out their paſſions and prejudices, their ſtrong and weak ſides.

In the mean time, the inſinuator was occupied in drawing up a new ſtatement of every thing he had been able to diſcover of the character and conduct of the novice. This ſtatement was tranſmitted to the ſuperiors, and compared with the former. If the novice was approved, he was then admitted to the ſecond degree, upon his anſwering, in a ſatisfactory manner, twenty-four grand queſtions, which might enable the order to judge of his principles and the credit to which he was entitled, and would fix him down by ſtronger ties to the authority of the ſuperiors. The deteſtable principles of the illuminees now begin to appear, as will be evident from the following queſtions which we have ſelected :

17 Power of life and death claimed by the ſociety.

Have you ſeriouſly reflected on the importance of the ſtep you take, in binding yourſelf by engagements that are unknown to you? Should you ever diſcover in the order any thing wicked or unjuſt to be done, what part would you take? Do you, moreover, grant the power of life and death to our order or ſociety? Are you diſpoſed, upon all occaſions, to give the preference to men of our order over all other men? Do you ſubject yourſelf *to a blind obedience, without any reſtriction whatſoever?*

The novice having thus ſurrendered his conſcience, his will, and his life, to the devotion of the conſpirators, and thus ſubſcribed, with his own hand, and confirmed by his oath, a reſolution to become the moſt abject ſlave, was now deemed qualified to aſcend to the ſecond degree, called *Minerval*.

18 Admiſſion to the degree of Minerval.

In the dead hour of midnight he was conducted to a retired apartment, where two of the order were waiting to receive him. The ſuperior, or his delegate, appeared ſtanding in a ſevere and threatening poſture ; he held a glimmering lamp in his hand, and a naked ſword lay before him. The novice was aſked, whether he ſtill perſiſted in his intention of adhering to the order? Upon anſwering in the affirmative, he was ordered into a dark room, there to meditate in ſilence on his reſolution. On his return, he was ſtrictly and repeatedly queſtioned if he was determined to give implicit obedience to all the laws of the order? The inſinuator became ſecurity for his pupil, and then requeſted for him the protection of the order, which the ſuperior granted with great ſolemnity, proteſting that nothing would be found there hurtful to religion, to morals, or to the ſtate. Having thus ſaid, the ſuperior takes up the naked ſword, and pointing it at the heart of the novice, threatens him with the fatal conſequences of betraying the ſecrets of the order. The novice again takes an oath, by which he binds himſelf, in the moſt unlimited manner, to ſerve the order with his life, honour, and eſtate, and to obſerve an inviolable obedience and fidelity to all his ſuperiors. He is then admitted a Minerval, and henceforth is allowed to attend the academy of the ſect.

19 Minerval academy;

The Minerval academy was compoſed of 10, 12, or 15 Minervals, and placed under the direction of a major Illuminee. It met twice every month in an inner apartment, ſeparated from the other rooms of the manſion by an antichamber; the door of which was to be ſhut with care during the meeting, and ſtrongly ſecured by bolts. At the commencement of every meeting, the preſident read and commented upon ſome ſelect paſſages of the Bible, Seneca, Epictetus, Marcus Aurelius, or Confucius ; evidently with a view of diminiſhing the reverence for the ſacred writings, by thus placing them on a level with the heathen moraliſts. Then each brother was aſked what books he had read ſince laſt meeting, what obſervations he had made, and what ſervices he had performed for promoting the ſucceſs of the order?

20 Its library.

To each Minerval academy a library belonged. This was formed by the contributions of the brethren, by preſents of books, and by another method very extraordinary. All Illuminees acting as librarians, or keepers of archives, were admoniſhed to *ſteal* ſuch books or manuſcripts as might be uſeful to the order. At one time, ſending a liſt of the books which he wiſhed to be embezzled from the library of the Carmes, Weiſhaupt ſays, "All theſe would be of much greater uſe if they were in our hands. What do thoſe raſcals do with all theſe books?"

Every brother at his admiſſion was required to declare to what art or ſcience he meant chiefly to apply ; and it was expected, that he ſhould afterwards every year give an account of the diſcoveries or improvements which he had made. All the other brethren who were occupied in the ſame ſtudies, were deſired to give him every poſſible aſſiſtance. Thus a kind of academy was formed, to which thoſe who could not ſerve it by their talents might give pecuniary contributions. That this academy might have the appearance of a literary ſociety, prizes were annually diſtributed ; the beſt diſcourſe was publiſhed, and the profits ſent to the coffers of the order.

Every month the preſident was to take a review of the faults which he had obſerved in his pupils, and examine them concerning thoſe which they might have been conſcious of in themſelves ; and it would be an unpardonable neglect, ſay the ſtatutes, ſhould any pupil pretend, that during the ſpace of a whole month he had remarked nothing reprehenſible.

It is impoſſible to read theſe rules without admiring them. Were men but half as anxious, attentive, and careful, to render themſelves good citizens and good men, as theſe men were to render themſelves ſucceſsful conſpirators, what a bleſſed world ſhould we ſee!

21 Admiſſion to the degree of minor illuminee.

The Minerval was rigorouſly ſcrutinized, whether he was ready to ſubmit to every torture, or even to commit ſuicide, rather than give any information againſt the order. Suicide was reckoned not only innocent, but honourable, and was alſo repreſented as a peculiar ſpecies of voluptuouſneſs. In order to diſcover the ſentiments of the Minervals upon this ſubject, they were required to write a diſſertation upon the character and death of Cato, or any ſimilar ſubject. They were alſo deſired to diſcuſs the favourite doctrine of Weiſhaupt, that *the end ſanctifies the means*; a principle of the moſt pernicious tendency, which would render calumny, aſſaſſination, ſedition, and treaſon, laudable, and excellent. Next, they were called upon to compoſe a diſſertation, by which their opinions concerning kings and prieſts might be aſcertained. If they performed all theſe taſks with the ſpirit of an infidel, and the deſperate firmneſs of a conſpirator, they were then judged worthy of being promoted to the degree of minor illuminee.

22 Minor illuminees trained for the degree of

The minor illuminees held meetings ſimilar to thoſe of the Minerval academy. It was neceſſary that the preſident ſhould be one who was raiſed to the degree of prieſt, and initiated in the myſteries: but he was required to perſuade his pupils, that beyond the degree which he had attained there were no myſteries to be diſcloſed. The minor illuminees were to be ſo trained, that they might look upon themſelves as the founders of the order; that by this powerful motive they might be animated to diligence and exertion. With this view, hints were ſcattered rather than precepts enjoined. It was inſinuated, that the world was not ſo delightful as it ought; that the happineſs for which man was made is prevented by the misfortunes of ſome, and the crimes of others; that the wicked have power over the good; that partial inſurrection is uſeleſs; and that peace, contentment, and ſafety, might be eaſily obtained by means drawn from the greateſt degree of force of which human nature is capable. Such views, it is added, actuating a ſecret ſociety, would not only be innocent, but moſt worthy of the wiſe and well-diſpoſed.

Weiſhaupt had formed, with peculiar care, a code for this degree, which was intitled *Inſtructions for forming uſeful Labourers in Illuminiſm*. Theſe inſtructions diſcover an aſtoniſhing knowledge of human nature, and are drawn up with a degree of ſyſtematic coolneſs which perhaps no conſpirator before him ever exhibited. He lays down rules, by which the character of almoſt any perſon may be aſcertained. He recommends to the minor illuminees, to attend to the conduct of any perſon entruſted to their care, at two periods; when he is tempted to be what he ought not to be, and when, removed from the influence of every external temptation, he follows the dictates of his inclination. They were to ſtudy the peculiar habits and ruling paſſions of each; to kindle his ardour by deſcanting on the dignity of the order, and the utility of its labours; to infuſe a ſpirit of obſervation, by aſking queſtions, and applauding the wiſdom of the anſwers; to correct the failings of their pupil, by ſpeaking of them as if they were not his, and thus making him judge in his own cauſe; to inſtruct and adviſe, not by tedious declamation, but by ſometimes dropping a few words to the purpoſe, when the mind ſhould be in a proper ſtate to receive them. Above all, they were directed to avail themſelves of thoſe moments when they obſerved a pupil diſcontented with the world. "It is then (ſays Weiſhaupt) you muſt preſs the ſwelling heart, ſtimulate the ſenſibility, and demonſtrate how neceſſary ſecret ſocieties are for the attainment of a better order of things."

23 Scotch novice.

Having paſſed with applauſe through the ſtates of probation already deſcribed, the minor illuminee is promoted to the rank of major illuminee, or Scotch novice. As major illuminee, he is encompaſſed with more rigid chains; and as Scotch novice, he is diſpatched as a miſſionary into maſonic lodges, to convert the brethren to illuminiſm.

The candidate for this degree is ſtrictly examined, in order to diſcover what opinions he now entertains concerning the object of the ſociety; the motives that prompted him to join it; whether he is diſpoſed ſtill to co-operate with the reſt of the brethren in accompliſhing the grand object; and whether he be a member of any other ſociety; and what are the duties which it requires.

24 Candidates for higher degrees ſubmit to new trials.

The fertile genius of Weiſhaupt is not exhauſted; he has ſtill in reſerve artifices more profound, and bonds more powerful; his reſources keep pace with the progreſs of his ſchemes. He now lays a ſnare for his pupils, from which he hopes none can eſcape, and therefore he flatters himſelf they are his for ever. He demands of every candidate for higher degrees, to write, as a proof of confidence, a minute and faithful account of his whole life, without any reſerve or diſſimulation. Reſerve or diſſimulation would indeed be vain; for the moſt ſecret circumſtances of his life are already well known to the adepts, my means of innumerable ſpies, who, by the appointment of the ſuperiors, have, unknown to him, been watching and ſcrutinizing all his actions and words, his temper, paſſions, and opinions.

Now is preſented to the candidate the code of the brother ſcrutator, called by the order the *noſce te ipſum* (know thyſelf). This is a catechiſm, containing from a thouſand to fifteen hundred queſtions, concerning his perſon, his health, his education, his opinions, his inclinations, his habits, his paſſions, his prejudices, and even his weakneſſes. Queſtions are alſo propoſed reſpecting his acquaintances, his relations, friends, and enemies. The candidate is required to enumerate his favourite colours, to deſcribe his language, the nature of his converſation, his gait and geſtures. Nothing, in ſhort, is omitted that can tend to diſtinguiſh his character as an individual, or as a member of ſociety. Upon many qualities in his character, thirty, forty, or ſometimes near a hundred queſtions are propoſed. The following ſpecimen will enable the reader to judge what aſtoniſhing care Weiſhaupt employed to diſcriminate characters.

Is his *gait* ſlow, quick, or firm? Are his ſteps long, ſhort, dragging, lazy, or ſkipping? Is his *language* regular, diſorderly, or interrupted? In ſpeaking, does he agitate his hands, his head, or his body with vivacity? Does he cloſe upon the perſon he is ſpeaking to? Does he hold him by the arm, clothes, or button hole? Is he a great talker, or is he taciturn? If ſo, why? Is it through prudence, ignorance, reſpect, or ſloth? &c. Concerning his *education*, he is queſtioned to whom does he owe it? Has he always been under the eyes of his parents? How has he been brought up? Has he any eſteem for his maſters? Has he travelled, and in what countries?

By theſe queſtions his temper and diſpoſitions might be accurately known. His leading paſſions would be diſcovered by the following queries. "When he finds himſelf with different parties, which does he adopt; the ſtrongeſt or the weakeſt; the wittieſt or the moſt ſtupid? Or does he form a third? Is he conſtant and firm in ſpite of all obſtacles? How is he to be gained? by praiſe, by flattery, or low courtſhip; by women, money, or the entreaties of his friends? Does he love ſatire; and on what does he exerciſe that talent? on religion, hypocriſy, intolerance, government, miniſters, monks?" &c.

All theſe queſtions are to be anſwered and illuſtrated by facts. It is neceſſary to obſerve, that the ſcrutators alſo give in written anſwers to all theſe queſtions. When the candidate has thus given a minute hiſtory of his life, and revealed all his ſecrets, his foibles, his errors, his vices, and his crimes, Weiſhaupt triumphantly exclaims, "Now I hold him; I defy him to hurt us; if he ſhould wiſh to betray us, we have alſo his ſecrets."

The adept is next introduced into a dark apartment, where he ſolemnly ſwears to keep ſecret whatever he may learn from the order. He then delivers up the hiſtory of his life, ſealed, when it is read to the lodge, and compared with the character drawn of him by the brother ſcrutators. A corner of the veil is now lifted up, ſtill, however, with extreme caution. Nothing appears palpable but the pureſt principles and moſt generous deſigns. At the ſame time many things are darkly ſuggeſted, which are incompatible with purity and generoſity; for while the utmoſt care is employed to deceive the underſtanding, nothing is neglected that can tend ſecretly to corrupt the heart. A number of queſtions are aſked; the evident intention of which is to make the adept diſcontented with the preſent moral government of the world, and to excite the deſire of attempting a great revolution. After anſwering theſe queſtions, the ſecretary opens the code of the lodge; and having informed the young illuminee that the object of the order is to diffuſe the pure truth, and to make virtue triumph, he proceeds to ſhow that this is to be accompliſhed by freeing men from their prejudices, and enlightening their underſtandings. "To attain this, (continues the ſecretary), we muſt trace the origin of all ſciences, we muſt reward oppreſſed talents, we muſt undertake the education of youth; and, forming an indiſſoluble league among the moſt powerful geniuſes, we muſt boldly, though with prudence, combat ſuperſtition, incredulity, and folly; and at length form our people to true, juſt, and uniform principles on all ſubjects." The ſecretary adds, that in attempting to diveſt vice of its power, that the virtuous may be rewarded even in this world, the order is counteracted by *princes and prieſts, and the political conſtitutions of nations;* that, however, it was not intended to excite revolutions and oppoſe force by force, but merely to bind the hands of the protectors of diſorder, and to govern without appearing to command; that the powers of the earth muſt be encompaſſed with a legion of indefatigable men, all directing their labours towards the improvement of human nature. Were there but a certain number of ſuch men in every country, each might form two others. "Let theſe (ſays he) only be united, and nothing will be impoſſible to our order." All this is very ſpecious; it is well contrived to faſcinate the imagination of the young, and the heart of the generous and benevolent, while, under all this pretended regard to virtue and to the happineſs of mankind, is concealed a moſt formidable conſpiracy againſt the peace of the world.

After this addreſs is delivered, the major illuminee is preſented with the codes of the inſinuator and ſcrutator; for he muſt now inſpect the pupils of the inſinuators, and muſt exerciſe the office of ſcrutator while preſiding over the Minerval academies.

25
The degree of Scotch knight.

The next degree, which is that of Scotch knight, is both intermediate and ſtationary. It is ſtationary for thoſe who are not ſufficiently imbued with the principles of the order, and intermediate for thoſe who have imbibed the true ſpirit of illuminiſm. The Scotch knights were appointed the directors of all the preparatory degrees, and to watch over the intereſts of the order within their diſtrict. They were to ſtudy plans for increaſing the revenues of the order, and to endeavour to promote to public offices of confidence, of power and wealth, as many of the adepts as poſſible; and to ſtrive to acquire an abſolute ſway in the maſonic lodges. They were to procure the management of the maſonic funds; and while they were to perſuade the brethren that theſe were expended according to their own orders, they were to employ them for promoting the views of the order. Thus one office of the Scotch knights was to embezzle the money that was entruſted to them, in order to diffuſe truth, and to make virtue triumph.

After paſſing with applauſe through this long and tedious probation, the adept is introduced to the claſs of the myſteries. He is not yet, however, made acquainted with the whole ſecrets of the ſociety; he muſt ſtill ſubmit to new trials; his curioſity muſt be farther excited, his imagination muſt be kept longer upon the ſtretch, and his principles of depravity be rendered more violent and inveterate before the vail be entirely withdrawn, which will diſcover to him Weiſhaupt and his infernal crew, plotting the deſtruction of the laws, ſciences and religion of mankind. The degree of epopt or prieſt, to which the adept was next raiſed, opened to view, however, ſo great a part of the myſteries, that the reader will be fully prepared to expect the ſecrets which remain to be unfolded in the other degrees.

26
Preparations for the prieſthood.

Before being admitted to the degree of epopt, the adept was required to give a written anſwer to ten preliminary queſtions. The inſinuations againſt the eſtabliſhed order of the world, which had formerly been ſlightly mentioned, increaſe now to an indirect propoſal to attempt a complete revolution. The candidate is aſked, whether he thinks the world has arrived at that happy ſtate which was intended by nature? Whether civil aſſociations and religion attain the ends for which they were deſigned? Whether the ſciences are conducive to real happineſs? or whether they are not merely the offspring of the unnatural ſtate in which men live, and the crude inventions of crazy brains? It is then propoſed as a queſtion, whether there did not in ancient times exiſt an order of things more ſimple and happy? What are the beſt means for reſtoring mankind,

kind to that ſtate of felicity? Should it be by public meaſures, by violent revolutions, *or by any means that would enſure ſucceſs?* Would it not be proper, with this view, to preach to mankind a religion more perfect, and a philoſophy more elevated? And, in the meantime, is it not adviſable to diſſeminate the truth in ſecret ſocieties?

Should the anſwers given to theſe queſtions accord with the ſentiments of the order, on the day fixed for the initiation, the candidate is blindfolded, and, along with his introducer, is put into a carriage, the windows of which are darkened. After many windings and turnings, which it would be impoſſible for the adept to trace back, he is conducted to the porch of the temple of the myſteries. His guide ſtrips him of the maſonic inſignia which he wore as a knight, removes the bandage from his eyes, and preſents him with a drawn ſword; and then having ſtrictly enjoined him not to advance a ſtep till he is called, leaves him to his meditations. At length he hears a voice exclaiming, "Come, enter, unhappy fugitive; the fathers wait for you; enter, and ſhut the door after you." He advances into the temple, where he ſees a throne with a rich canopy riſing above it, and before it, lying upon a table, a crown, a ſceptre, a ſword, ſome pieces of gold, and precious jewels, interlaid with chains. At the foot of the table, on a ſcarlet cuſhion, lie a white robe, a girdle, and the ſimple ornaments of the ſacerdotal order. The candidate is required to make his choice of the attributes of royalty, or of the white robe. If he chuſe the white robe, which he knows it is expected he ſhould do, the hierophant, or inſtructor, thus addreſſes him: "Health and happineſs to your great and noble ſoul. Such was the choice we expected from you. But ſtop; it is not permitted you to inveſt yourſelf with that robe until you have heard to what we now deſtine you." The candidate is then ordered to ſit down; the book of the myſteries is opened, and the whole brethren liſten in ſilence to the voice of the hierophant.

27
Inſtructions previous to admiſſion.

The exordium is long and pompous; much artifice is concealed in it, and much eloquence diſplayed. It expatiates on the ſublime and generous views of the ſociety; evidently with the deſire of lulling aſleep the ſuſpicion of the candidate, of exciting him to admiration, and of inſpiring him with enthuſiaſm. The hierophant then proceeds to unveil the myſteries. He launches out into a ſplendid deſcription of the original ſtate of mankind; when health was their ordinary ſtate, when meat, and drink, and ſhelter, were their only wants. At that period (ſays he) men enjoyed the moſt ineſtimable bleſſings, *equality and liberty;* they enjoyed them to their utmoſt extent: but when the wandering life ceaſed, and property ſtarted into exiſtence; when arts and ſciences began to flouriſh; when a diſtinction of ranks and civil aſſociations were eſtabliſhed, "liberty was ruined in its foundation, and equality diſappeared. The world then ceaſed to be a great family, to be a ſingle empire; the great bond of nature was rent aſunder." Wants now increaſed, and the weak imprudently ſubmitted to the wiſe or the ſtrong, that they might be protected. As the ſubmiſſion of one perſon to another ariſes from wants, it ceaſes when the wants no longer exiſt. Thus the power of a father is at an end when the child has acquired his ſtrength. Every man, having attained to years of diſcretion, may govern himſelf; when a whole nation, therefore, is arrived at that period, there can exiſt no farther plea for keeping it in wardſhip.

Such a ſtate as that of civil ſociety, is then repreſented as incompatible with the practice of virtue. "With the diviſion of the globe, and of its ſtates, benevolence (ſays the hierophant) was reſtrained within certain limits, beyond which it could no longer be extended. Patriotiſm was deemed a virtue; and he was ſtyled a patriot who, partial towards his countrymen, and unjuſt to others, was blind to the merits of ſtrangers, and believed the very vices of his own country to be perfections. We really beheld (continues he) patriotiſm generating localiſm, the confined ſpirit of families, and even egoiſm. Diminiſh, reject that love of country, and mankind will once more learn to know and love each other as men. Partiality being caſt aſide, a union of hearts will once more appear, which will expand itſelf over the globe."

Theſe unphiloſophical declamations, enthuſiaſtically pronounced, at length make the proſelyte exclaim, in uniſon with his maſter, "Are ſuch then the conſequences of the inſtitution of ſtates, and of civil ſociety? O folly! Oh people! that you did not foreſee the fate that awaited you; that you ſhould yourſelves have ſeconded your deſpots in degrading human nature to ſervitude, and even to the condition of the brute!"

Having wrought up the proſelyte to this pitch of frenzy, and enumerated all the evils which, according to Weiſhaupt, ariſe from political aſſociation, the hierophant comes to reveal the means by which the grievances of the human race may be redreſſed. "Providence (he ſays) has tranſmitted the means to us of ſecretly meditating, and at length operating, the ſalvation of human kind. Theſe means are the ſecret ſchools of philoſophy. Theſe ſchools have been in all ages the archives of nature, and *of the rights of man.* Theſe ſchools ſhall one day retrieve the fall of human nature, and PRINCES AND NATIONS SHALL DISAPPEAR FROM THE FACE OF THE EARTH; and that without any violence. Human nature ſhall form one great family, and the earth ſhall become the habitation of the man of reaſon. *Reaſon ſhall be the only book of laws, the ſole code of man.* This is one of our *grand myſteries.* Attend to the demonſtration of it; and learn how it has been tranſmitted down to us."

This pretended demonſtration makes part of the ſame ſophiſtical harangue; and conſiſts in panegyrics on the dignity of human nature; in a baſeleſs morality; and in a ſcandalous perverſion of the Chriſtian ſcriptures, with a blaſphemous account of the miniſtry of the Saviour of the world.

"What ſtrange blindneſs (continues the hierophant) can have induced men to imagine, that human nature was always to be governed as it has hitherto been? Where is the being, who has condemned men, the beſt, the wiſeſt, and the moſt enlightened men, to perpetual ſlavery? Why ſhould human nature be bereft of its moſt perfect attribute, that of governing itſelf? Why are thoſe perſons to be always led who are capable of conducting themſelves? Is it then impoſſible for mankind, or at leaſt the greater part of them, to come to majority? Are we then fallen ſo low as not even to feel our chains, as to hug them, and not cheriſh the flattering hope of being able to break them, and recover our liberty? No; let us own that it is not impoſſible to attain UNIVERSAL INDEPENDENCE."

28 The illuminees enemies to commerce.

The principal means which Weiſhaupt offers to his adepts for the conqueſt of this land of promiſe, is to diminiſh the wants of the people; and accordingly the code denounces eternal war with every ſpecies of commerce. Hence the hierophant proceeds to inform the candidate, that he who wiſhes to ſubject nations to his yoke, need but to create wants, which he alone can ſatisfy." "Confer (ſays he) upon the *mercantile tribe* ſome rank or ſome authority in the government, and you will have created perhaps the moſt formidable, the moſt deſpotic of all powers. He, on the contrary, who wiſhes to render mankind free, teaches them how to refrain from the acquiſition of things which they cannot afford: he enlightens them, he infuſes into them bold and inflexible manners. If you cannot diffuſe, at the ſame inſtant, this degree of light among all men, at leaſt begin by enlightening yourſelf, and by rendering yourſelf better. The mode of diffuſing univerſal light is, not to proclaim it at once to the whole world, but to begin with yourſelf; then turn to your next neighbour: you two can enlighten a third and a fourth: let theſe in the ſame manner extend and multiply the number of the children of light, until *numbers and force ſhall throw power into your hands.* You will ſoon acquire ſufficient force to *bind the hands of your opponents, to ſubjugate them,* and to ſtifle wickedneſs in the embryo;" *i. e.* you will ſoon be able to ſtifle every principle of law, of government, of civil or political ſociety, whoſe very inſtitution, in the eyes of an illuminee, is the germ of all the vices and misfortunes of human nature.

29 Their morality;

The hierophant, continuing to inſiſt on the neceſſity of enlightening the people to operate the grand revolution, ſeems to be apprehenſive that the candidate may not yet clearly conceive the real plan of this revolution, which is in future to be the ſole object of all his inſtructions. Let your inſtructions and lights be univerſally diffuſed; ſo ſhall you render mutual ſecurity univerſal; *and ſecurity and inſtruction will enable us to live without prince or government.* The inſtruction which is to accompliſh this great end, is inſtruction in *morality*, and *morality alone;* for "*true morality* is nothing elſe than the art of teaching men to *ſhake off their wardſhip*, to attain the age of manhood; and thus to need neither princes nor governments. The morality which is to perform this miracle, is not a morality of vain ſubtleties. It is not that morality which, degrading man, renders him careleſs of the goods of this world, forbids him the enjoyment of the innocent pleaſures of life, and inſpires him with the hatred of his neighbour. *Above all*, it muſt *not* be that morality which, adding to the miſeries of the miſerable, throws them into a ſtate of puſillanimity and deſpair, *by the threats of hell and the fear of devils.* It muſt be a divine doctrine, ſuch as Jeſus taught to his diſciples, and of which he gave the real interpretation in his ſecret conferences."

30 And blaſphemies of Chriſt.

The impious hierophant then proceeds, with matchleſs blaſphemy, to repreſent the Redeemer of mankind as teaching, like the Grecian ſophiſts, an exoteric and an eſoteric doctrine. He deſcribes him as the grand maſter of the illuminees; and affirms, that the object of his *ſecret*, which is loſt to the world in general, has been preſerved in their myſteries. It was "to reinſtate mankind in their ORIGINAL EQUALITY and LIBERTY, and to prepare the means. This explains in what ſenſe Chriſt was the *Saviour and Redeemer of the world.* The doctrine of original ſin, of the fall of man, and of his regeneration, can now be underſtood. The ſtate of pure nature, of fallen or corrupt nature, and the ſtate of grace, will no longer be a problem. Mankind, in quitting their ſtate of *original liberty, fell* from the ſtate of nature, and *loſt their dignity.* In their civil ſociety, under their governments, they no longer live in the ſtate of *pure* nature, but in that of *fallen* and *corrupt* nature. If the moderating of their paſſions, and the diminution of their wants, reinſtate them in their primitive dignity, that will really conſtitute their *redemption* and their *ſtate of grace.* It is to this point that morality, and the moſt perfect of all morality, that of Jeſus, leads mankind. When at length this doctrine ſhall prevail throughout the world, the reign of the good and of the elect ſhall be eſtabliſhed."

31 Preparatory rites to

This language (as M. Barruel obſerves) is ſurely not enigmatical; and the proſelyte who has heard it without ſhuddering, may flatter himſelf with being worthy of this Antichriſtian prieſthood. He is led back to the porch, where he is inveſted with a white tunic and broad ſcarlet belt of ſilk. The ſleeves of the tunic, which are wide, are tied in the middle and at the extremities with ribbons likewiſe of ſcarlet; and the candidate is recalled into the temple of myſteries. He is met by one of the brethren, who does not permit him to advance till he has declared "whether he perfectly underſtands the diſcourſe which has been read to him; whether he has any doubts concerning the doctrines taught in it; whether his heart is penetrated with the ſanctity of the principles of the order; whether he is ſenſible of the call, feels the ſtrength of mind, the fervent will, and all the diſintereſtedneſs requiſite to labour at the *grand undertaking;* whether he is ready to make a ſacrifice of *his will*, and to ſuffer himſelf to be *led* by the moſt *excellent ſuperiors of the order.*"

32 Initiation to the prieſthood

The rites of the preceding degree were in impious deriſion of the ſacrament of the Lord's ſupper; thoſe of the preſent are an atrocious mimicry of ſacerdotal ordination; at which, as every one knows, the Lord's ſupper is likewiſe celebrated. A curtain is drawn, and an altar appears with a crucifix upon it. On the altar is a bible; and the ritual of the order lies on a reading deſk, with a cenſer and a phial full of oil beſide it. The dean, or preſident, who acts the part of a biſhop, bleſſes the candidate, cuts hair from the crown of his head, anoints him, clothes him in the veſtments of the prieſthood, and pronounces prayers after the faſhion of the order. He preſents him with a cap, ſaying, "Cover thyſelf with this cap; it is more precious than the royal diadem." The mock communion is then diſtributed; and it conſiſts of milk and honey, which the dean gives to the proſelyte, ſaying, "This is that which nature gives to man. Reflect how happy he would ſtill have been, if the deſire of ſuperfluities had not, by depriving him of a taſte for ſuch ſimple food, multiplied his wants, and poiſoned the balm of life."

The ceremonies are terminated by delivering to the epopt that part of the code which relates to his new degree.

33 Duties of the prieſt or epopt.

Among the inſtructions which it contains, the following are more particularly worthy of notice. The epopt, ſays the code, " will take care that the writings of the members of the order ſhall be cried up, and that the trumpet of fame ſhall be ſounded in their honour. He will alſo find means of *hindering the reviewers from caſting any ſuſpicions* on the writers of the ſect." He is likewiſe inſtructed to *bribe* the common people into the intereſts of the order, and to corrupt their minds, by getting poſſeſſion of ſchools and other ſeminaries of learning. But " if it be neceſſary for us to be maſters of the ordinary ſchools (ſays the impious legiſlator), of how much more importance will it be to gain over the *Eccleſiaſtic ſeminaries and their ſuperiors!* With them we gain over the chief part of the country; we acquire *the ſupport of the greateſt enemies to innovation;* and the grand point of all is, that through *the clergy* we become *maſters of the middle and lower claſſes of the people.*"

34 Qualifications for the degree of regent.

From the degree of epopt or prieſt are choſen the *regents* or *prince illuminees.* On making this choice, ſays the code, three things of the utmoſt conſequence are to be obſerved. " *1ſt,* The greateſt reſerve is neceſſary with reſpect to this degree: *2dly,* Thoſe who are admitted into it, muſt be as much as poſſible *free men,* and *independent of princes:* *3dly,* They muſt have clearly manifeſted their *hatred of the general conſtitution,* or the *actual ſtate* of mankind; and have ſhewn how evidently they wiſh for a *change in the government of the world.*" If theſe requiſites be found in an epopt who aſpires to the degree of regent, ſix preliminary queſtions are put to him; of which the obvious meaning is to diſcover, whether he deems it lawful and proper to teach ſubjects to throw off the authority of their ſovereigns, or, in other words, to deſtroy every king, miniſter, law, magiſtrate, and public authority on earth.

35 Admiſſion to this degree.

When theſe queſtions are anſwered to the ſatisfaction of his examiner, he is informed, " that as, in future, he is to be entruſted with papers belonging to the order of far greater importance than any which he has yet had in his poſſeſſion, it is neceſſary that the order ſhould have farther ſecurities. He is, therefore, commanded to make his *will,* and inſert a clauſe with reſpect to any private papers which he may leave, in caſe of ſudden death. He is to get a formal or juridical receipt for that part of his will from his family, or from the public magiſtrate; and he is to take their promiſes in writing, that they are to fulfil his intentions." This precaution being taken, and the day fixed for his inauguration, he is admitted into an antechamber hung with black, where he ſees a ſkeleton, elevated two ſteps, with a crown and ſword lying at its feet. Having given up the written diſpoſitions, &c. reſpecting his papers, his hands are loaded with chains as if he were a ſlave, and he is left to his meditations. A dialogue then takes place between his introducer and the provincial, who is ſeated on a throne in a ſaloon adjoining. It is in a voice loud enough to be heard by the candidate, and conſiſts of various queſtions and anſwers; of which the following may ſerve for a ſpecimen:

Prov. Who has reduced him to this ſtate of ſlavery?

Anſ. by the Introd. SOCIETY, GOVERNMENTS, the SCIENCES, and falſe RELIGION.

Prov. And he wiſhes to caſt off this yoke, to become a ſeditious man and a rebel?

Anſ. No; he wiſhes to unite with us, to JOIN IN OUR FIGHTS AGAINST THE CONSTITUTION OF GOVERNMENTS, the corruption of morals, and the profanation of religion. He wiſhes, through our means, to become POWERFUL, that he may attain the GRAND ULTIMATUM.

Prov. Is he ſuperior to *prejudices?* Does he prefer the *general intereſt of the univerſe* to that of *more limited aſſociations?*

Anſ. Such have been his promiſes.

Prov. Aſk him, whether the ſkeleton which is before him be that of a *king,* a *nobleman,* or a *beggar?*

Anſ. He cannot tell; all that he ſees is, that this ſkeleton was a man like us; and the character of *man* is all that he attends to.

After a great deal of inſidious mummery like this, the epopt is admitted to the degree of prince; but before his inveſtiture with the inſignia of that order, he is exhorted to be *free, i. e.* to be a man, and a man who knows how to *govern himſelf;* a man who knows his duty, and his *impreſcriptible rights;* a man who ſerves the *univerſe alone;* whoſe actions are ſolely directed to the *general benefit* of the world and of human nature. " Every thing elſe (ſays the provincial) is INJUSTICE." A long panegyric is then made on the happineſs which will be experienced by mankind, when *every father* of a family ſhall be *ſovereign* in his tranquil cot! when he that wiſhes to invade theſe *ſacred rights* ſhall not find an aſylum on the face of the earth! when idleneſs ſhall be no longer ſuffered; and when *the clod of uſeleſs ſciences ſhall be caſt aſide* (c)!

36 Sign of the degree.

The *ſign* of this degree conſiſted in extending out the arms to a brother with the hands open; the *gripe* was to ſeize the brother by the two elbows, as it were to prevent him from falling; and the *word* was REDEMPTION! The epopt was inveſted with his principality by receiving a buckler, boots, a cloak, and a

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(c) This will naturally ſurpriſe our readers; but it could not ſurpriſe him to whom it was addreſſed; for when candidate for the prieſthood, he had been aſked, " Do the ſciences which men cultivate furniſh them with real lights? Are they conducive to real happineſs? Are they not, on the contrary, the offspring of numberleſs wants, and of the unnatural ſtate in which men live? Are they not the crude inventions of crazy brains?" There were, however, to be academies for the cultivation of ſuch ſciences as ſuited the deſigns of the order. Each academy was to conſiſt of nine epopts, of whom ſeven were to preſide reſpectively over ſo many departments of ſcience, whilſt the other two were to officiate as ſecretaries. One of the departments included the occult ſciences, to which belonged the art of *raiſing the ſeals of the letters* of all who belonged not to the order, and of ſecuring their own letters againſt ſimilar practices!!

hat; and on receiving the boots, he was deſired to *fear no road* which might lead to the propagation or diſcovery of *happineſs*. Thus decorated, the prince illuminee received the *fraternal embrace*, and heard the inſtructions for his new degree.

One would think that the adept had now arrived at the very acmé of profaneneſs, and treaſonable conſpiracy. He has been initiated in myſteries which burleſque Chriſtianity and its Divine Author, and at the ſame time vow vengeance againſt all government, all law, and all ſcience; yet Weiſhaupt, in a letter to Cato Zwack, his incomparable man, ſays, that he has compoſed four degrees above that of regent, or prince-illuminee; with reſpect even to the *loweſt* of which, his degree of prieſt will be found no more than child's play. "The ritual of theſe degrees, (ſays he), I never ſuffer to go out of my hands. It is of too ſerious an import; it is the key of the ancient and modern, the religious and political, hiſtory of the univerſe."

This caution of the chief conſpirator has deprived us of the power to give ſo particular an account of theſe degrees as we have done of the preceding; but the Abbé Barruel aſſures us that they were reduced to two, viz. that of MAGUS, and that of the MAN-KING; and that theſe two conſtituted the GREATER MYSTERIES. When the adept was admitted to the degree of *magus*, he was illuminized only in philoſophy and religion; when to that of *man-king*, new lights were given him reſpecting property, and every ſpecies of political aſſociation. The Abbé quotes a paſſage from *the Critical hiſtory of all the degrees of illuminiſm*, written by a man of honour, who had paſſed through them all, which will give the reader a ſufficient idea of the object of theſe laſt degrees.

37 Objects of the degrees of magus and man-king.

"With reſpect to the two degrees of *magus* and of *man-king* (ſays this writer), there is no reception, that is to ſay, there are no ceremonies of initiation. Even the elect are not permitted to tranſcribe theſe degrees; they only hear them read, and that is the reaſon why I do not publiſh them with this work. The firſt is that of Magus, called alſo philoſopher. It contains the fundamental principles of Spinoziſm. Here every thing is *material*; God and the world are but one and the ſame thing; all religions are inconſiſtent, chimerical, and the invention of ambitious men."

That this is the doctrine of Spinoza, and that Spinoza was an atheiſt, is moſt certain; but though nothing can be *eſſentially* worſe than atheiſm, we are ſtrongly inclined to ſuſpect that, at the initiation of the Magus, expreſſions muſt have been uſed more *ſhocking at leaſt to the ear* than the philoſophic jargon of the apoſtate Jew. It is long ſince the philoſophy of Spinoza was in Germany recommended from the preſs (ſee SPINOZA, *Encycl.*); it is but very lately that a profeſſor in the univerſity of Jena publiſhed a book, in which he teaches that there is *no God*, and that we abſurdly give that title to *the relations of Nature* (D); and ſomething approaching ſo near to atheiſm had been communicated to the adept when he was admitted to the prieſthood, that we are perſuaded Weiſhaupt muſt have alluded to *language* at leaſt different from that in which Spinoza taught his dark doctrines, and that language, accompanied perhaps with impious and audacious geſtures, when he ſaid that, compared with his higher myſteries, his degree of prieſt was but child's play.

38 Atheiſm and

What gives ſome degree of probability to this conjecture, if it be nothing more, is the following fact related by the Abbé Barruel. During the French revolution (ſays that able and well informed writer), a comedian appeared (E), dreſſed in the ſacerdotal robes of the illuminees, and perſonally defying Almighty God. "No! (ſaid the impious wretch) thou doſt not exiſt. If thou haſt power over the thunderbolts, graſp them; aim them at the man who dares ſet thee at defiance in the face of thy altars. But no! I blaſpheme thee, and I ſtill live. No! thou doſt not exiſt." It will be ſeen by and bye, that the chiefs of the revolution, and even numbers of their tools, were illuminized; and it is improbable that this blaſphemer, who was arrayed in the inſignia of the epopts, made uſe of the language and geſtures of the higher myſteries? Whether it be or not, M. Barruel has proved, even from the writings of Weiſhaupt himſelf, that the magi were at leaſt atheiſts of the ſchool of Spinoza.

"The ſecond degree of the grand myſteries, called the *Man-king*, teaches (according to the author of the Critical Hiſtory), that every inhabitant of the country or town, every father of a family, is ſovereign, as men formerly were in the times of the patriarchial life, to which mankind is once more to be carried back; that in conſequence all authority and all magiſtracy muſt be deſtroyed."

39 Savagiſm.

This may appear to be nothing more than what the adept has been already taught in the leſſer myſteries; and it is in fact nothing more than that to which he muſt have ſeen theſe myſteries tending; but the reader underſtands not the language of the illuminees, if he ſuppoſes that, by the patriarchal ſtate, they mean ſuch a ſtate as that of the patriarchs of the Old Teſtament. No! their patriarchal ſtate is the fancied ſavage ſtate of the atheiſtical philoſophers of Greece and Rome, when mankind had neither property nor fixed habitation. This is evident from one of the diſcourſes of the hierophant; in which he tells the adept, that it would have been happy for man "had he known how to preſerve himſelf in the primitive ſtate in which Nature had placed him! But ſoon the unhappy germ developed itſelf in his heart, and reſt and happineſs diſappeared. As families multiplied, the neceſſary means of ſubſiſtence began to fail. *The Nomade or roaming life ceaſed; property began; men choſe fixed habitations; agriculture brought them together;* LIBERTY WAS RUINED IN ITS FOUNDATIONS, AND EQUALITY DISAPPEARED."

To reſtore that liberty and equality, therefore, which is the ultimate object of the order, and conſtitutes the MAN-KING, all property muſt be aboliſhed, every houſe burnt, as well the cottage of the peaſant as the palace of the prince; and mankind muſt once more inhabit woods and caverns without clothes and without fire, and ſally out occaſionally to encounter their fellow-brutes,

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(D) We learned this from the letter already quoted in note (A.)

(E) He does not ſay where this appearance was made; but the circumſtances related lead us to ſuppoſe that it was in a church.

brutes, and to ſearch for food among the wild herbs of the deſert. According to Mochus the Phenician, and the Greek philoſophers of this hopeful ſchool, this was the original ſtate of man* ; and to this ſtate it was the object of Weiſhaupt and his adepts to reduce man again. Hence we hear them laviſhing the moſt rapturous encomiums on the Goths and Vandals who over-ran the Roman empire, annihilated the arts, put a ſtop to agriculture, and burnt the towns and villages of civilized Europe! It was thus, according to the illuminees, that thoſe barbarians regenerated mankind : but the regeneration was not complete ; for the Goths and Vandals could not preſerve themſelves from the contagion of civil life; and their fall from ſavagiſm to ſcience drew from Weiſhaupt's hierophants the moſt piteous lamentations!

40
The laſt ſecret of the order.

The laſt ſecret communicated to the moſt favoured adepts was the novelty of the order. Hitherto their zeal had been inflamed, and their reſpect demanded to an inſtitution pretended to be of the higheſt antiquity. The honour of inſtituting the myſteries had been ſucceſſively attributed to the children of the Patriarchs, to ancient philoſophers, even to Chriſt himſelf, and to the founders of the maſonic lodges (ſee MASONRY in this *Suppl.*) But now the time is come when the adept, initiated in the higher myſteries, is ſuppoſed to be ſufficiently enthuſiaſtic in his admiration of the order, to be entruſted with the hiſtory of its origin. Here then they inform him, that this ſecret ſociety, which has ſo artfully led him from myſtery to myſtery ; which has with ſuch perſevering induſtry rooted from his heart every principle of religion, all love of his country, and affection for his family ; all pretenſions to property, to the excluſive right to riches, or to the fruits of the earth ;—this ſociety, which has taken ſo much pains to demonſtrate the tyranny and deſpotiſm of all laws human and divine, and of every government, whether monarchical, ariſtocratical, or republican ; which has declared him free, and taught him that he has no ſovereign on earth or in heaven ; no rights to reſpect in others, but thoſe of perfect equality, of ſavage liberty, and of the moſt abſolute independence ; that this ſociety is not the offspring of an ignorant and ſuperſtitious antiquity, but of modern philoſophy ; in one word, that the true father of illuminiſm is no other than Adam Weiſhaupt, known in the ſociety by the name of SPARTACUS ! This *important* ſecret, however, remained a myſtery even to the greater part of the *magi* and the *man-kings*, being revealed only to the grand council of *areopagites*, and to a few other adepts of diſtinguiſhed merit.

41
Propoſal for a female order,

So zealouſly was the order bent upon propagating its execrable principles through the whole world, that ſome of the chiefs had planned an order of female adepts, in ſubſerviency to the deſigns of the men. "It will be of great ſervice, (ſays *Cato*-Zwack), it will procure us both information and money, and will ſuit charmingly the taſte of ſome of our trueſt members, who are lovers of the ſex." An aſſeſſor of the Imperial chamber at Wetzlar, of the name of Dittfurt, but known among the illuminees by that of *Minos*, expreſſed even his deſpair of ever bringing men to the grand object of the order without the ſupport of female adepts ; and he makes an offer of his own wife and his four daughters-in-law to be firſt initiated. This order was to be ſubdivided into two claſſes, each forming a ſeparate ſociety, and having different ſecrets. The firſt was to be compoſed of virtuous women ; the ſecond of the wild, the giddy, and the voluptuous. The brethren were to conduct the firſt, by promoting the reading of good books ; and to train the ſecond to the arts of *ſecretly gratifying their paſſions*. The wife of an adept named Ptolemy Magus was to preſide over one of the claſſes ; which (ſays Minos) will become, under her management and his, a very pretty ſociety. "You muſt contrive pretty degrees, and dreſſes, and ornaments, and elegant and decent rituals. No man muſt be admitted. This will make them more keen, and they will go much farther than if we were preſent, or than if they thought that we knew of their proceedings. Leave them to the ſcope of their own fancies, and they will ſoon invent myſteries which will put us to the bluſh, and myſteries which we can never equal. They will be our great apoſtles. Reflect on the reſpect, nay, the awe and terror, inſpired by the female myſtics of antiquity. Ptolemy's wife muſt direct them, and ſhe will be inſtructed by Ptolemy ; and my ſtep-daughters will conſult with me. We muſt always be at hand to prevent the introduction of any improper queſtion. We muſt prepare themes for their diſcuſſion : thus we ſhall confeſs them, and inſpire them with our ſentiments. No man, however, muſt come near them. This will fire their roving fancies, and we may expect rare myſteries !"

42
Rejected by Spartacus.

But notwithſtanding all the plans and zeal of this profligate wretch and others of the fraternity, it does not appear that the General *Spartacus* ever conſented to the eſtabliſhment of the ſiſterhood. He ſupplied, however, the want of ſuch an inſtitution, by ſecret inſtructions to the regents, on the means of making the influence of women over men ſubſervient to the order, without entruſting them with any of the ſecrets. "The fair ſex (ſays he) having the greateſt part of the world at their diſpoſal, no ſtudy is more worthy the adept than the *art of flattery*, in order to gain them. They are all more or leſs led by vanity, curioſity, pleaſure, or the love of novelty. It is on that ſide, therefore, they are to be attacked, and by that to be rendered ſubſervient to the order." That Weiſhaupt's ſagacity had not on this occaſion forſaken him, is very evident ; ſince it has been proved that the German fair, who were the correſpondents of the illuminees, welcomed the French invaders of their native country.* Nay, ſo lately as laſt winter, our correſpondent in Saxony heard ſeveral of theſe illuminized ladies expreſs a wiſh that the French might invade and conquer England ; for then, ſaid they *tea and coffee would be cheaper !*

It is not enough for the founder of a ſect of conſpirators to have fixed the preciſe object of his plots. His accomplices muſt form but one body, animated by one ſpirit ; its members muſt be moved by the ſame laws, under the inſpection and government of the ſame chiefs. A full account of the government of Weiſhaupt's order will be found in the valuable work of Abbé Barruel ; our limits permit us to give only ſuch a general view of it as may put our readers on their guard againſt the ſecret machinations of theſe execrable villains, whoſe lodges are now recruiting, under different denominations, in every country in Europe.

Wherever illuminiſm has gained a footing, as the means of

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* See Doig's *Letter on the Savage State.*

* Dr Robiſon's *Proofs of a Conſpiracy.*

43 Subordination of the illuminees. of ſubordination, there is a general diviſion of command as well as of locality. The *candidates* and *novices* are each under the direction of his own inſinuator, who introduces him into the *Minerval lodges;* each *Minerval lodge* has a ſuperior from among the preparatory claſs, under the inſpection of the intermediary claſs. So many lodges conſtitute a diſtrict, under the direction of a ſuperior, whom the order calls *dean.* The dean is ſubjected to the *provincial,* who has the inſpection and command of all the lodges and deaneries of the province. Next in order comes the *national ſuperior,* who has full power over all within his nation, provincials, deans, lodges, &c. Then comes the ſupreme council of the order, or the *areopagites,* over which preſides the *general* of illuminiſm. Thus has the order formed within itſelf a ſupreme tribunal, to whoſe inquiſition all nations are to be ſubjected. The areopagites, conſiſting of twelve fathers of the order, with the general at their head, form the centre of communication with all the national ſuperiors on earth; each *national* is the centre of one particular nation; the *provincial,* of one province; the *dean,* of the lodges within his deanery; the *minerval maſter,* of his academy; the *venerable,* of his maſonic lodge; and the *inſinuator* or *recruiter,* of his *novices* and *candidates.*

44 Their mode of correſpondence; The higher degrees (ſays Weiſhaupt in one of his inſtructions to the regents) muſt always be hidden from the lower. The ſimple illuminee, therefore, correſponds with his immediate ſuperior, knowing perhaps no other member of the order; the latter, with his dean; and thus gradually aſcending to the national ſuperiors, who alone are acquainted with the reſidence of the areopagites, as they again are with the name and reſidence of the general. Any member, however, of the inferior degrees, may occaſionally correſpond with his unknown ſuperiors, by addreſſing his letters *Quibus licet;* and in theſe letters he may mention whatever he thinks conducive to the advancement of the order. If he be a novice, he may in theſe letters inform his ſuperiors how his inſtructor behaves to him, or may draw the character of any perſon whatever. When the letter of any adept contains ſecrets, or complaints which he chuſes to conceal from his immediate ſuperior, he directs it *Soli* or *Primo;* and then it can be opened only by the *provincial,* the *national ſuperior,* the *areopagites,* or the *general,* according to the rank of the writer, which is by ſome contrivance unknown to M. Barruel, indicated on the outſide of the letter. The *provincial* opens the letters of the *minor* and *major* illuminees which are directed *Soli;* the *Quibus licets* of the epopts; and the *Primos* of the novices; but he cannot open either the *Primo* of the minerval, the *Soli* of the Scotch knight, or the *Quibus licet* of the regent. He can only form a conjecture as to the perſons who open his own letters, and thoſe which he is not permitted to open himſelf.

45 And of giving importance to their order, When it conſidered, that by one of Weiſhaupt's ſtatutes, the provincial has in each chapter or diſtrict a confidential epopt, who is his *ſecret cenſor* or *ſpy;* that theſe ſpies are to inſinuate themſelves into all companies, and collect *anecdotes of ſecret hiſtory;* that the hiſtorian of the province is to inſert theſe anecdotes into a journal kept for that purpoſe; and that the provincials are obliged to forward the contents of theſe journals to the high ſuperiors of the order—ſome notion may be formed of the influence of the general and areopagites in every country into which illuminiſm has found its way. "The means of acquiring an aſcendancy over men (ſays Weiſhaupt) are incalculable. Who could enumerate them all? They muſt vary with the diſpoſition of the times. At one period, it is a taſte for the marvellous that is to be wrought upon. At another, the lure of ſecret ſocieties is to be held out. For this reaſon, it is very proper to make your inferiors believe, without telling them the real ſtate of the caſe, that all other ſecret ſocieties, particularly that of *Freemaſonry, are ſecretly directed by us.* Or elſe, and IT IS REALLY THE FACT IN SOME STATES, THAT POTENT MONARCHS ARE GOVERNED BY OUR ORDER. When any thing remarkable or important comes to paſs, hint that it *originated with our* order. Should any perſon by his merit acquire a great reputation, let it be generally underſtood that *he is one of us.*

46 By every means, good or bad. "If our order cannot eſtabliſh itſelf in any particular place, with all the forms and regular progreſs of our degrees, *ſome other form muſt be aſſumed.* Always have *the object* in view; that is the eſſential point. No matter what *the cloak* be, provided you ſucceed; *a cloak,* however, *is always neceſſary,* for in *ſecrecy our ſtrength lies.* The INFERIOR LODGES OF FREEMASONRY ARE THE MOST CONVENIENT CLOAKS for our GRAND OBJECT; becauſe the world is already familiarized with the idea, that *nothing of importance* or *worthy of their attention can ſpring from maſonry.*" No artifice, however, is to be left untried. "You may attend large and commercial towns during the times of fairs in different characters; as *a merchant, an officer, an abbé.* Everywhere you will perſonate an extraordinary man, having important buſineſs on your hands; but all this muſt be done with a great deal of *art and caution,* leſt you ſhould have the appearance of an adventurer. You may write your orders with a *chymical preparation of ink,* which *diſappears after a certain time.* Never loſe ſight of the *military ſchools,* of the *academies, printing preſſes, libraries, cathedral chapters,* or *any public eſtabliſhments* that can influence *education* or *government.* Let our regents perpetually attend to the various means, and form plans, for MAKING US MASTERS *of all theſe eſtabliſhments.* When an author ſets forth principles true in themſelves, but which do not as yet ſuit *our general plan of education for the world,* or principles, the publication of which is premature; every effort muſt be made to *gain over the author:* but ſhould all our attempts fail, and we ſhould prove unable to entice him into the order, *let him be diſcredited by every poſſible means.*"

Of their methods of diſcrediting authors, one has come to our knowledge, which muſt be intereſting to ſome of our readers. Dr Robiſon's work, entitled *Proofs of a Conſpiracy,* &c. which firſt unmaſked theſe hypocrites in this country, found its way into Germany, and was tranſlated into the German language, and expoſed to ſale at the Leipſic fairs. The illuminees, under the diſguiſe of *merchants* and *abbés,* attended, and bought up the whole impreſſion, which they committed to the flames. A ſecond edition was publiſhed, and it ſhared the ſame fate(F). This was a more compendious way of anſwering the learned author

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(F) This information was communicated to us by a gentleman of character, who was at Leipſic when the thor than that which has been adopted by the Jacobin journaliſts in London; but perhaps it may convince the readers of theſe journals, that the Doctor has not ſo far miſtaken the ſenſe of the writings of *Philo* and *Spartacus*, as their illuminiſed maſters wiſh them to believe.

47 Illuminiſm of France

When theſe arts of diſſeminating the diſorganizing and impious principles of the order are duly conſidered, and when it is remembered that its emiſſaries dare not diſobey a ſingle injunction of the high ſuperiors, without expoſing themſelves to poiſon, or to the daggers of a thouſand unſeen aſſaſſins, no man can be ſurpriſed to learn that the illuminees contributed greatly to the French revolution. The philoſophers of France had indeed prepared the public mind for embracing readily the doctrines of illuminiſm; and ſo early as 1782, *Philo* and *Spartacus* had formed the plan of illuminizing that nation; but they were afraid of the vivacity and caprice of the people, and extended not their attempts, at that time, beyond Straſbourg. Already, however, there exiſted ſome adepts in the very heart of the kingdom; and the Marquis de Mirabeau, when ambaſſador at the court of Berlin, was initiated at Brunſwick by a diſciple of Philo Knigge's. On his return to France he began to introduce the new myſteries among his maſonic brethren.

48 By means of free maſonry.

The ſtate of free maſonry was at that time peculiarly adapted to the views of the conſpirators. The French had engrafted on the old and innocent Britiſh maſonry a number of degrees gradually riſing above each other, to the very myſteries of illuminiſm itſelf (See MASONRY, in this *Suppl.*). Theſe were called the *philoſophical* degrees, and comprehended the *knights of the ſun*, the higher *Roſicrucians*, and the *knights Kadeſh*. At the head of all theſe ſocieties, whether ancient or modern, were three lodges at Paris, remarkable for the authority which they exerciſed over the reſt of the order, and Philip of Orleans was the grand-maſter. So early as the year 1787, France contained 282 towns, in which were to be found regular lodges under the direction of that execrable wretch. He increaſed their number, by introducing to the *maſonic* myſteries the loweſt of the rabble, as well as thoſe French guards whom he deſtined to the ſubſequent attack of the baſtile, and to the ſtorming of the palace of his near relation and royal maſter. In every country town and village lodges were open for aſſembling the workmen and peaſantry, in hopes of heating their imaginations with the ſophiſticated ideas of equality and liberty, and the rights of man; and it was then that Mirabeau invited a deputation from the order of Weiſhaupt, which very quickly diffuſed the light of illuminiſm through the whole kingdom. Inſtead of *Spartacus*-Weiſhaupt, *Cato*-Zwack, and *Philo*-Knigge, we find wielding the firebrands of revolution in the capital of France, *Philip of Orleans*, *Mirabeau*, *Syeyes*, and *Condorcet*. The day of general inſurrection was fixed by theſe miſcreants for the 14th of July 1789. At the ſame hour, and in all parts of France, the cries of *equality* and *liberty* reſounded from the lodges. The Jacobin clubs were formed; and hence ſprung the revolution, with all its horrors of atheiſm, murder and maſſacre!

In ſupport of this account of the illuminees we have not loaded our margin with authorities; becauſe our detail has been taken wholly from the valuable works of Abbé Barruel and Dr Robiſon, to which we refer our readers for much curious information that our limits do not permit us to give. We cannot, however, conclude the article, without making ſome remarks on that ſpecious principle by which the conſpirators have deluded numbers, who abhor their impieties, and who would not go all their length, even in rebellion; we mean the maxim, that "it is our duty to love all men with an equal degree of affection, and that any partial regard for our country, or our children, is unjuſt."

49 Reflections on the fundamental principles of illuminiſm;

That this maxim is falſe, every *Chriſtian* knows, becauſe he is enjoined to "do good indeed unto all men, but *more eſpecially* to them who are of the houſehold of faith;" becauſe he is told that "if any man provide not for his *own*, and eſpecially for thoſe of his *own houſe*, he hath denied the faith, and is worſe than an infidel;" becauſe his divine maſter, immediately after reſolving all duty into the love of God and man, delivers a parable to ſhew, that we neither can, nor ought to love all men *equally*; and becauſe the ſame Divine Perſon had one diſciple whom he loved more than the reſt. But we wiſh thoſe *philoſophers*, who talk perpetually of *the mechaniſm* of the human mind, and at the ſame time affect to have no *partial* fondneſs for any individual, but to love all with the ſame degree of *rational* affection, to conſider well whether ſuch philanthropy be conſiſtent with what they call (very improperly indeed) *mechaniſm*. If this mechaniſm be (as one of them ſays it is) nothing more than *attraction* and *repulſion*, we know that it *cannot* extend with equal force over the whole world; becauſe the force of attraction and repulſion varies with the diſtance. If by this abſurd phraſe, they mean a ſet of *inſtinctive* propenſities, or feelings, we know that among ſavages, who are more governed by inſtinct than civilized men, philanthropy is a feeling or propenſity of a very limited range. If they believe all our paſſions to originate in ſelf love, then is it certain that our philanthropy muſt be progreſſive; embracing firſt, and with ſtrongeſt ardour, our relations, our friends and our neighbours; then extending gradually through the ſociety to which we belong; then graſping our country, and laſt of all the whole human race. Perhaps they may ſay that reaſon teaches us to love all men equally, becauſe ſuch equal love would contribute moſt to the ſum of human happineſs. This ſome of them indeed have actually ſaid; but it is what no man of reflection can poſſibly believe. Would the ſum of human happineſs be increaſed, were a man to pay no greater attention to the education of his own children than to the education of the children of ſtrangers? were he to do nothing more for his aged and helpleſs parents than for any other old perſon whatever? or were he to neglect the poor in his neighbourhood, that he might relieve thoſe at the diſtance of 1000 miles? Theſe queſtions are too abſurd to merit a ſerious anſwer.

When a man, therefore, boaſts of his univerſal benevolence, declaring himſelf ready, without fee or reward, to ſacrifice every thing dear to him for the benefit

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two impreſſions of the book were thus diſpoſed of. The Abbé Barruel's work has no doubt been anſwered in the ſame way, though we cannot ſay ſo upon the ſame authority.

fit of ſtrangers whom he never ſaw; and when he condemns, in the cant phraſe of faction, that narrow policy which does not conſider the whole human race as one great family—we may ſafely conclude him to be either a conſummate hypocrite who loves none but himſelf, or a philoſophical fanatic, who is at once a ſtranger to his duty and to the workings of his own heart.

50 Exemplified in the conduct of the illuminees.

If this concluſion require any farther proof, we have it in the conduct of Weiſhaupt and his areopagites. In the hand writing of *Cato*, his *incomparable man*, was found the deſcription of a ſtrong box, which, if forced open, would blow up and *deſtroy its contents;* ſeveral receipts for *procuring abortion;* a compoſition which *blinds or kills* when ſpurted in the face; *tea* for procuring abortion; *Herbæ quæ habent qualitatem deletheream;* a method for filling a bed chamber with *peſtilential vapours;* how to take off impreſſions of ſeals, ſo *as to uſe them afterwards as ſeals;* a receipt *ad excitandum furorem uterinum;* and a diſſertation on *ſuicide*. Would genuine philanthropiſts have occaſion for ſuch receipts as theſe? No! the order which uſed them was founded in the moſt conſummate villany, and by the moſt deteſtable hypocrite. The inceſtuous Weiſhaupt ſeduced the widow of his brother, and ſolicited poiſon and the dagger to murder the woman whom he had fondly preſſed in his arms. "Execrable hypocrite (ſays M. Barruel), he implored, he conjured both art and friendſhip, to deſtroy the innocent victim, the child, whoſe birth muſt betray the morals of his father. The ſcandal from which he ſhrinks, is not that of his crime: it is the ſcandal which, publiſhing the depravity of his heart, would deprive him of that authority by which, under the cloak of virtue, he plunged youth into vice and error. *I am on the eve* (ſays he) *of loſing that reputation which gave me ſo great authority over our people: My ſiſter-in-law is with child. I will hazard a deſperate blow, for I neither can nor will loſe my honour.*" Such is the benevolence of thoſe who, baniſhing from their minds all partial affection for their children and their country, profeſs themſelves to be members of one great family, the family of the world!

IMAGINARY QUANTITIES, or *Impoſſible Quantities*, in algebra, are the even roots of negative quantities; which expreſſions are Imaginary, or impoſſible, or oppoſed to real quantities; as $\surd - aa$, or $^4\surd - a^4$, &c. For as every even power of any quantity whatever, whether poſitive or negative, is neceſſarily poſitive, or having the ſign $+$, becauſe $+$ by $+$, or $-$ by $-$, give equally $+$; hence it follows that every even power, as the ſquare for inſtance, which is negative, or having the ſign $-$, has no poſſible root; and therefore the even roots of ſuch powers or quantities are ſaid to be impoſſible or imaginary. The mixt expreſſions ariſing from imaginary quantities joined to real ones, are alſo imaginary; as $a - \surd - aa$, or $b + \surd - aa$.

IMAGINARY Roots of an equation, are thoſe roots or values of the unknown quantity, which contain ſome imaginary quantity. Thus, the roots of the equation $xx + aa = 0$, are the two imaginary quantities $+ \surd - aa$ and $- \surd - aa$, or $+ a \surd - 1$ and $- a \surd - 1$.

IMPACT, the ſimple or ſingle action of one body upon another to put it in motion. Point of impact is the place or point where a body acts.

IMPERFECT NUMBER, is that whoſe aliquot parts, taken all together, do not make a ſum that is equal to the number itſelf, but either exceed it, or fall ſhort of it; being an abundant number in the former caſe, and a defective number in the latter. Thus, 12 is an abundant imperfect number, becauſe the ſum of all its aliquot parts, 1, 2, 3, 4, 6, makes 16, which exceeds the number 12. And 10 is a defective imperfect number, becauſe its aliquot parts, 1, 2, 5, taken all together, make only 8, which is leſs than the number 10 itſelf.

IMPERIALE, a city of Chili in South-America, 6 leagues from the South Sea, having the river Cauten to the ſouth and another river to the weſt, both navigable. It is ſituated on a riſing ſteep neck of land, hard to be aſcended. In 1600, it was taken by the Indians, after a year's ſiege; moſt of the inhabitants having periſhed by famine. They burnt the town, and then laid ſiege to Soforno. In this war Valdivia, Argol, Sancta Cruz, Chilla, and Villa Rica were taken. After which they became ſo confident of their ſtrength, that they fought the Spaniards bravely, and in ſome meaſure revenged the cruelties they had committed upon their countrymen. The Spaniards afterwards built a town here called *Conception*. S. lat. 38° 42′, W. long. 73° 25′.—*Morſe.*

IMPOST, in architecture, a capital or plinth, to a pillar, or pilaſter, or pier, that ſupports an arch, &c.

Doctrine of Impulſion.

IMPULSION, is the term employed in the language of mechanical philoſophy, for expreſſing a ſuppoſed peculiar exertion of the powers of body, by which a moving body changes the motion of another body by hitting or ſtriking it. The plaineſt caſe of this action is when a body in motion hits another body at reſt, and puts it in motion by the ſtroke. The body thus put in motion is ſaid to be IMPELLED by the other; and this way of producing motion is called IMPULSION, to diſtinguiſh it from PRESSION, THRUSTING, or PROTRUSION, by which we puſh a body from its place without ſtriking it. The term has been gradually extended to every *change* of motion occaſioned by the colliſion of bodies.

1 Hiſtory of it.

When ſpeculative men began to collect into general claſſes, the obſervations made during the continual exertions of our own perſonal powers on external bodies, in order to gain the purpoſes we had in view, it could not be long before they remarked, that as we, by the ſtrength of our arm, can move a body, can ſtop or any how change its motion; ſo a body already in motion produces effects of the ſame kind in another body, by hitting it. Such obſervations were almoſt as early and as intereſting as the other; and the attention was very forcibly turned to the general facts which obtained in this way of producing motion; that is, to the expiſcation of the general laws of impulſion. We do not find, however, in what remains of the phyſical ſcience of the ancients, that they had proceeded far in this claſſification. While mechanics, or the ſcience of machines, had acquired ſome form, and had been the ſubject of ſucceſsful mathematical diſcuſſion, we do not find that any thing ſimilar had been done in the ſcience of impulſe. Yet the artillery of ancient times was very ingenious and powerful. But although Vegetius, and Ammianus Marcellinus, and Hero, deſcribe the mechaniſm of theſe engines with great care, and frequently with mathematical ſkill, we ſee no attempts to aſcertain with preciſion the force of the miſſile weapon, or to ſtate the efficacy of the battering ram, by meaſures of the momentum, and compariſon of it with the reſiſtance oppoſed to it. The engineers were contented with very vague notions on theſe points.

Ariſtotle, in his 20th Mechanical Queſtion, and Galen in ſome occaſional obſervations, are the only authors of antiquity whom we recollect as treating the force of impulſe as a quantity ſuſceptible of meaſure. Their obſervations are extremely vague and trivial, chiefly directed, however, to the diſcrimination of the force of impulſe from that of preſſure.

In more modern times, great additions had already been made to the aſſiſtance we had derived from the impulſive efficacy of bodies in motion. Water-mills and wind-mills had been invented, and had been applied to ſuch a variety of purpoſes, that the engineers were faſt acquiring more diſtinct notions of the force of impulſe. Naval conſtruction was changed in ſuch a manner, that there hardly remained any thing of the ancient rigging. The oblique action of wind and water were now found even more effective than the direct; and ſhips could now ſail with almoſt any wind. All theſe things fixed the attention of the engineers and of the ſpeculatiſt on the numberleſs modifications of the force of impulſe.

But it ſoon appeared that this was a refined branch of knowledge, and required a more profound ſtudy than any other department of the ſcience of motion. At the ſame time, it was equally clear, that it was alſo of ſuperior importance. Mills worked by cattle, or by men's hands, were everywhere giving place to wind and water mills; and a ſhip alone appeared to every intelligent mechanician to be the greateſt effort of human invention, and moſt deſerving his careful ſtudy. All theſe improvements in the arts of life derived their efficacy from the impulſe of bodies. The laws of impulſion, therefore, became the objects of ſtudy to all who pretended to philoſophical ſcience. But this is a branch of ſtudy wholly new, and derives little aſſiſtance from the mechanical ſcience already acquired; for that was confined to the determination of the circumſtances which regulated the equilibrium of forces, either in their combined action on bodies in free ſpace, or by the intervention of machines. But in the production of motion by impulſe, the equilibrium is not ſuppoſed to obtain; and therefore its rules will not ſolve the moſt important queſtion, "What will be the preciſe motion?"

Galileo, to whom we are indebted for the firſt diſcoveries in the doctrine of free motions, was alſo the firſt who attempted to bring impulſion within the pale of mathematical diſcuſſion. This he attempted, by endeavouring to ſtate what is the force or energy of a body in motion. The very obſcure reflections of Ariſtotle on this ſubject only ſerved to make the ſtudy more intricate and abſtruſe. Galileo's reflections on it are void of that luminous perſpicuity which is ſeen in all his other writings, and do not appear to have ſatisfied his own mind. He has recourſe to an experiment, in order to diſcover what preſſure was excited by impulſion. A weight was made to fall on the ſcale of a balance, the other arm of which was loaded with a conſiderable weight; and the force of the blow was eſtimated by the weight which the blow could thus ſtart from the ground. The reſults had a certain regularity, by which ſome analogy was obſerved between the weights thus ſtarted and the velocity of the impulſe; but the anomalies were great, and the analogy was ſingular and puzzling; it led to many intricate diſcuſſions, and ſcience advanced but ſlowly.

2
Laws of impulſion diſcovered by Wallis, Wrenn, and Huyghens.

At laſt the three eminent mathematicians, Dr Wallis, Sir Chriſtopher Wrenn, and Huyghens, about the ſame time, and unknown to each another, diſcovered the ſimple and beautiful laws of colliſion, and communicated them to the Royal Society of London in 1668 (Phil. Tranſ. n° 43—46). Sir Chriſtopher Wrenn alſo invented a beautiful method of demonſtrating the doctrine by experiment. The bodies which were made to ſtrike each other were ſuſpended by threads of equal length, ſo as to touch each other when at reſt. When removed from this their vertical ſituation, and then let go, they ſtruck when arrived at the loweſt points of their reſpective circles, and their velocities were proportional to the chords of the arches through which they had deſcended. Their velocities, after the ſtroke, were meaſured, in like manner, by the chords of their arches of aſcent. The experiments correſponded preciſely with the theoretical doctrine.

In the mean time, this ſubject had keenly occupied the attention of philoſophers, who found it to be of a very abſtruſe nature; or, which is nearer the truth, they indulged in great refinement in proſecuting the ſtudy. The firſt attempts to meaſure the impulſive force of bodies, by ſetting it in oppoſition to preſſures, which had long been meaſured by weights, gave riſe to ſome very refined reflections on the nature of theſe two kinds of forces. Ariſtotle had ſaid that they were things altogether diſparate. If ſo, there can be no proportion between them. Yet the analogy obſerved in the experiments above mentioned of Galileo, ſhewed that impulſe could be gradually augmented, till it exceed any preſſure. This indicates ſameneſs in kind, according to Euclid himſelf. A curious experiment of Galileo's, in which the impulſe of a vein of water was ſet in equilibrio with a weight, ſeemed not only to eſtabliſh this identity beyond a doubt, but even to ſhew the origin of preſſure itſelf. The weight in one ſcale is ſuſtained as long as the ſtream of water continues to ſtrike the other ſcale. In this experiment, therefore, preſſure is equivalent to continual impulſe. But *continual* impulſe is not conceivable: we muſt conſider the impulſe of the ſtream as the *ſucceſſive* impulſe of the different particles of water, at intervals which are altogether indiſtinguiſhable.

From theſe conſiderations were deduced two very momentous doctrines: 1. That preſſure is nothing but repeated impulſe; 2. That although preſſure and impulſe are the ſame in kind, they are incomparable in magnitude. The impulſe is equal to the weight of a column of water, whoſe length is the height neceſſary for communicating the velocity. Now this is inceſſant; and the weight is ſuſtained during any the ſmalleſt moment of time, by the impulſe, not of the whole column, but of the inſenſible portion of it which is then making its ſtroke. Impulſe, therefore, is infinitely greater than preſſure.

3
Impulſe ſaid to be the only cauſe of motion.

Theſe abſtruſe ſpeculations have a charm for certain ingenious ſpeculative minds; and when indulged, will lead them very far. Accordingly, it was not long before ſome of the moſt ingenious philoſophers of Europe taught that impulſe was the ſole origin of preſſure.

There is but one moving power (ſaid they) in mechanical nature: This is impulſe.—*Nihil movetur* (ſays Euler) *niſi a contiguo et moto.* Moreover, having been long and familiarly converſant with the actions of animals, and the actions of moving bodies, and conceiving, with ſufficient diſtinctneſs, that impenetrable bodies cannot move without moving thoſe with which they are ſurrounded and in contact, they imagined that they fully underſtood how all this diſplacement of bodies is carried on; and therefore they maintained, that any motion is fully explained when it is ſhewn to be a caſe of impulſion. But they ſaw many caſes of motion where this impulſion could not be exhibited to the ſenſes. Thus, the fall of heavy bodies, the mutual approach or receſs of magnetic and electric bodies, exhibited no ſuch operation. But even here their experience helped them to an explanation. Air is an inviſible ſubſtance, and its very exiſtence was for a long time known to us only by means of its impulſe. As we ſee that preſſures are generated by the impulſe of water and of air, may there not be fluids ſtill more ſubtle than air, by whoſe inviſible impulſe bodies are made to fall, and magnets are made to approach or avoid each other? The impoſſibility of this cannot be demonſtrated, and the laws of impulſe had not as yet been ſo far inveſtigated as to ſhew that they were incompatible with thoſe productions of motion. It was therefore an open field for diſcuſſion; and the philoſophers, without farther heſitation, adopted, as a firſt truth, that ALL MOTION WHATEVER IS PRODUCED BY IMPULSION. The buſineſs of the philoſopher, therefore (ſay they), is to inveſtigate what combination of inviſible impulſions is competent to the production of any obſerved motion; ſuch as the fall of a heavy body, the elliptical motion of a planet, or the polarity of a magnetic needle. The curious diſpoſition of iron-filings round a magnet encouraged this kind of ſpeculation: It looks ſo like a ſtream of fluid; but it is a number of quieſcent fragments of iron. This does not hinder us from *ſuppoſing* ſuch a ſtream, not of iron-filings, but of a magnetic fluid, which will arrange (ſay the atomiſts) thoſe fragments, juſt as we ſee the flote-graſs in a brook arranged by a ſtream of water. Fluids, therefore moving in ſtreams, vortices, and a thouſand different ways, have been ſuppoſed, in order to *explain*, that is, to bring under a general known law of mechanical Nature, all thoſe caſes of the production of motion where impulſion is not obſerved by the ſenſes.

As we have gradually become better acquainted with the laws of the production of motion by impulſion, we have been able to explode many of thoſe proffered explanations, by ſhewing that the genuine reſults of the ſuppoſed inviſible motions, that is, the impulſions which they would produce, are very unlike the motions which we attempt to explain. It has been ſhewn, that the vortices ſuppoſed by Des Cartes, or by Leibnitz, or by Huyghens, cannot exiſt; and they have been given up. But it is anſwered to all thoſe demonſtrations of futility, that ſtill the axiom remains. Motion is produced only by impulſe; but we have not yet diſcovered all the poſſibilities of impulſion; and we muſt not deſpair of diſcovering that preciſe ſet of inviſible motions, and conſequent impulſions, of which the phenomenon before us is the neceſſary reſult.

4
The application of this principle is hazardous.

But this is by no means ſufficient authority for deſerting the rule of philoſophizing, ſo prudently and judiciouſly recommended by Sir Iſaac Newton; namely, not to admit as the cauſe of a phenomenon any thing that is not *ſeen* to operate in its production. The prudence of this reſtriction is evident; and it has alſo been ſufficiently ſhewn (Philosophy, *Encycl.* n° 48. &c.), that true philoſophical explanation, or extenſion of knowledge, is unattainable, if this rule be not ſtrictly adhered to. We therefore require a cogent reaſon for a practice that opens the door to every abſurdity, and that cannot give us the knowledge which we are in queſt of. What, then, is the reaſon that always induces philoſophers to have recourſe to impulſion for the explanation of a phenomenon, and to reſt ſatisfied in every caſe where it can be clearly proved that the phenomenon is really a caſe of impulſion? We ſay that we inquire into the reaſon why a body falls, and that we will be ſatisfied if it can be ſhewn us that it has received a number of impulſions downward. Do we inquire why a body in motion puts another body in motion by hitting it? And if we do, have we diſcovered the reaſon? We believe that none of the philoſophers, who have recourſe to inviſible impelling fluids, ever aſk a reaſon for motion by impulſion. Indeed they ſhould not, otherwiſe it would ceaſe to be a firſt principle of explanation. Other philoſophers, indeed (namely, ſuch as aſk no reaſon for the weight of a body, but the FIAT of the Almighty), require an explanation of motion by impulſe, and think that, in almoſt every caſe, they have found it out.

If the philoſophers aſk no reaſon for this production of motion, they muſt (that it may ſerve as a principle of explanation) ſay that impulſiveneſs is an original property of matter, either contingent or eſſential. Accordingly, we believe that this, or ſomething like this, has been aſſumed as a principle by the greater part of mechanicians. It has been aſſumed, as we have obſerved in the article Dynamics, *Suppl.* that a *moving body* poſſeſſes the power of producing motion in another body by hitting it; and they call it the IMPULSIVE FORCE *of moving bodies*—the FORCE INHERENT *in a moving body*. The reader will have obſerved, in our manner of treating that article, and alſo in ſeveral paſſages of different articles of the *Encyclopædia*, that we do not conſider this aſſumption as very clearly authoriſed by obſervation, or deducible by abſtract reaſoning, from the firſt principles of philoſophy. There is no branch of natural philoſophy on which ſo many ingenious diſſertations have been written; and perhaps there is none that has been more ſucceſsfully proſecuted: Yet this is the only part of the ſcience of motion that has given riſe to a ſerious diſpute; a diſpute that has divided, and ſtill divides, the mechanicians of Europe.

Some may think it preſumptuous in us, in a Work of this kind, which only aims at collecting and exhibiting in one view the *exiſting ſcience* of Europe, to pretend to give new doctrines, or to decide a queſtion which has called forth all the powers of a Leibnitz, a Bernoulli, a Jurin, a M'Laurin, &c. But we make no ſuch pretenſions; we only hope that, by ſeparating the queſtion from others with which it has, in every inſtance, been complicated, and by conſidering it apart, ſuch notions may be formed, in perfect conformity to the principles adopted by all parties, that the myſtery, which has gradually gathered like a cloud, may be diſpelled,

pelled, and all cauſe of difference taken away. We apprehend that this requires no very extenſive knowledge, but merely a ſtrict attention to the conceptions which we form of the actions of bodies on each other, and a preciſion in the uſe of the terms employed in the diſcuſſion.

5
Inquiry into its truth.

We truſt that our philoſophical readers perceive and approve of our anxiety to eſtabliſh (in the article DYNAMICS, *Suppl.)* the leading principles of mechanical philoſophy, from which we are to reaſon in future on acknowledged FACTS, or LAWS of human thought. It is not ſo much the queſtion, What is the eſſence of material Nature, from which all the appearances in the univerſe proceed? as it is, What do we know of it? how do we come by this knowledge? and what uſe can we make of it? The tænia knows nothing of the ſolar ſyſtem, and man is ignorant of the cauſe of impulſiveneſs. Other intelligent creatures may have ſenſes, of which this is the proper object; and others, of a ſtill more exalted rank, may perceive the operations of mind as clearly as we perceive thoſe of matter, while they are equally ignorant with ourſelves of the cauſes which connect the conjoined events in either of thoſe operations. But "known unto GOD, and to HIM alone, are ALL His works!"

6
We learn the exiſtence of matter chiefly by means of touch.

To accompliſh this purpoſe, we directed the reader's attention to what paſſes in his own mind when he thinks on the mechanical phenomena of Nature; on what he calls body; on the perceptions which bring it into his view, and which give him all the notions that he can form of its diſtinguiſhing, its characteriſtic properties. How does he learn that there is matter in a particular place? He has more than one mean of information; and each of theſe informs him of peculiar qualities of the thing which he calls *matter*. Many appearances ſuggeſt to his mind the preſence of a body. Show a monkey or a kitten (and even ſometimes a human infant) a mirror, and it will inſtantly grope round it to find a companion. Why does the creature grope about ſo? It is not contented with the firſt indication of matter, and nothing will ſatisfy it but touching or graſping what is behind the mirror. It is by our ſenſe of touch alone that we get the irreſiſtible conviction that matter or body is perceived by us, and it never fails to give us the perception; nay, we have the perception even in ſome caſes where the experienced philoſopher thinks himſelf obliged to doubt of its truth. Some ſenſations, ariſing from ſpaſm, cannot be diſtinguiſhed from the feelings of touch; and the patient inſiſts that ſomething preſſes on the diſeaſed part, while the phyſician knows that it is only a nervous affection. Every perſon will think that a cobweb touches his face when an electrified body is brought near it, and will try to wipe it off with his hand. But the modern philoſopher ſees good reaſon for aſſerting, that in this inſtance our feeling gives us very inaccurate, if not erroneous, information. He ſhews, that the fact, of which our feeling truly informs us, is the bending of the ſmall hairs or down which grow on the face, and that theſe only have been touched; and the followers of Æpinus deny that even this has been demonſtrated.

7
The exiſtence of [illegible] is ac[illegible] by the feeling of exerted preſſure

The philoſopher adopts this mode of perception as unqueſtionable, and allows that, and that alone, to be matter, which invariably produces this ſenſation by contiguity. But engaged in ſpeculations which fix his attention on the external object, he neglects and overlooks the inſtrument of information, and its manner of producing the effect, juſt as the aſtronomer overlooks the teleſcope, and the union and decuſſation of the rays of light which form the picture by which he perceives the ſatellite of Jupiter travel acroſs his diſk. The philoſopher finds it convenient to generaliſe the immenſe variety of touches which he feels from external bodies, and to conſider them as the operations of one and the ſame diſcriminating quality, a PROPERTY inherent in the external ſubſtance BODY; and he gives it a name, by which he can excite the ſame notion in the minds of his hearers. It is worth while to attend to what has been done in this matter, becauſe it gives much information concerning the firſt principles of mechaniſm. An exquiſite painting has ſometimes ſuch an appearance of prominence, that one is diſpoſed to draw the finger along it, and we expect to feel ſome roughneſs, ſome *obſtruction*, ſomething that prevents the finger from going over the place. Perhaps we doubt, and want to be aſſured. We preſs a little cloſer; but feel no obſtruction; and we deſiſt. The very firſt appearance, therefore, which this indicating quality, viewed as the *property* of external matter, has in our conceptions, is that of an obſtruction, an obſtacle, to the exertion of one of our natural powers. The power exerted on this occaſion is familiarly and *diſtinctively* known by the name of PRESSURE. This is the name of our own exertion, our own action; and, in this inſtance, and (we think) in this alone, the word is uſed purely, primitively, and without figure. When we ſay that a ſtone preſſes on the ground, we ſpeak figuratively, as truly as when we ſay that the candleſtick ſtands, and the ſnuffers lie, on the table. It is a perſonification, authoriſed by the ſimilarity of the effects and appearances. Further, when we ſpeak of our preſſure on any thing, with the intention of being preciſe in our communication, we ſpeak only of what obtains in the touching parts of the finger and the thing preſſed, paying no attention to the long train of intermediate exertions of the mind on the nerves, the nerves on the muſcular fibre, the fibre on the articulated machine, and the machine on the touching part of the finger. And thus the exertion of the ſentient and active being is attributed to the particles of lifeleſs inactive matter at the extremity of the finger, and theſe are ſaid to preſs immediately on the touching parts of the external body. And, laſtly, as this our exertion is unqueſtionably the perceived employment of a faculty in us, which we call *force, power, ſtrength*, diſtinguiſhing it from every other faculty by theſe names; we ſay (but figuratively), that force or power is exerted at the tips of the fingers, and we call it the FORCE OF PRESSURE.

8
And preſſure is conceived or ſuppoſed in almoſt every production of motion.

By far the greateſt part of our actions on external bodies is with the intention of putting them out of their preſent ſituations; and we can hardly ſeparate the thought of exerted preſſure from the thought of motion produced by it. Therefore, almoſt at its firſt appearance in the mind, preſſure comes before us as a MOVING POWER. Nay, we apprehend, that the more we ſpeculate, and the more we aim at preciſion in our conceptions, we ſhall be the more ready to grant that we have no clear *conception* of any other moving power. No man will contend that he has any conception at all of the power exerted by the mind in moving the body.

It is of importance to reflect on the manner in which this notion is extended to all other productions of motion. We think that this will ſhew, that in every caſe we ſuppoſe preſſure to be exerted.

9 Examination of the inſtances of this perception.

The philoſopher proceeds in his ſpeculations, and obſerves, that one man can preſs on another, and can puſh him out of his place, in the ſame way as he removes any other body; and he cannot obſerve any difference in his own exertions and ſenſations in the two caſes. But the man who is puſhed has the ſame feelings of touch and preſſure. By withdrawing from the preſſure, he alſo withdraws from the ſenſation; by withſtanding or reſiſting it, he feels the preſſure of the other man; and what he feels is the ſame with what he feels when he preſſes on the other perſon, or on any piece of matter. The ſame ſenſations of touch are excited. He attributes them to the preſſure of the other perſon. Therefore he attributes the ſame ſenſations to the counter-preſſure of any other body that excites them. Farther, he can reſiſt to ſuch a degree, that he is not puſhed from his place. In this caſe, the greateſt preſſure is exerted, and is felt by both. Each feels that the more he reſiſts, the greater is the mutual preſſure. And each feels that, unleſs he *not only do not reſiſt, but alſo withdraw himſelf* from the preſſure of the other, he will be preſſed, and the other will feel counter-preſſure, the ſame in kind with what is produced by his reſiſtance, though leſs in degree.

10 They are generally figurative.

All theſe things are diſtinctly and invariably felt; but they require attention, in order to be ſubjects of recollection and after-conſideration. From this, and no other ſource, are derived all our notions of corporeal preſſure, of counter-preſſure, of action, re-action, of *reſiſtance*, and of *inactivity* or *inertia*. Our notions of moving power, of the mobility of matter, and of the neceſſity of this power to produce motion in matter, have the ſame origin. Our notions alſo of the reſiſtance of inanimate matter, indicated by the expenditure of actual preſſure, are formed from the ſame premiſes: the counter-preſſure, or what at leaſt produces the ſame feelings in the perſon who is the mover, is conſidered as the property of dead matter; becauſe we feel, that if *we* do not exert real force, we are diſplaced by the ſame preſſure that would diſplace a lifeleſs body of the ſame bulk.

11 We obſerve many preſſures.

Theſe direct inferences are confirmed as we extend our acquaintance with things around us. We can exert our force in bending a ſpring, and we feel its counter-preſſure, preciſely ſimilar to that of another man. We feel that we muſt continue this preſſure, in order to keep it bent; and that as we withdraw our preſſure, the ſpring follows our hand, ſtill producing ſimilar feelings in our organs of touch, and requiring ſimilar exertions of our ſtrength to keep it in any ſtate of tenſion. Theſe phenomena are interpreted as indications of preſſures actually exerted by the ſpring, and quite different from what we ſhould feel from its mere reſiſtance to being moved. This action reſembles our own exertion in every particular; it produces all the effects of preſſure; it will ſqueeze in the ſoft flexible parts of our body with which we act on it; it will compreſs any ſoft body, juſt as we do ourſelves; it will put bodies in motion. Farther, we can ſet the action of one ſpring in oppoſition to that of another, and obſerve that each is bent by bending the other; and we ſee that their touching parts exert preſſure, for they will compreſs any ſoft body placed between them.

Thus, then, in all thoſe caſes, we have the ſame notion of the power immediately exerted between the two bodies, animated or inanimated. It is always preſſure. If indeed we begin to ſpeculate about the *modus operandi* in any one of theſe inſtances, we find that we muſt ſtop ſhort. How our preſſure excites the feeling of preſſure in the other perſon, or how it produces motion, eludes even conjecture—So it is—Nay, how our intention and volition cauſes our limb to exert this preſſure, or how the ſpringineſs of a ſpring produces ſimilar effects, remains equally hid from our ken. Unwearied ſtudy has greatly advanced our knowledge of theſe ſubjects in one reſpect. It has pointed out to us a train of operations, which go on in our animal frame before the oſtenſible preſſure is produced: we have diſcovered ſomething of their kind, and of the order in which they proceed; we have gone farther, and have diſcovered, in ſome of the preſſures exerted by lifeleſs matter, ſimilar trains of intervening operations. In the caſe of a ſpring, we have diſcovered that there is a certain combination of the properties of all its parts neceſſary for the viſible exertion. But what is the principle which thus makes them co-operate, we cannot tell, any more than in our own exertions of preſſure. Such being the origin of our notions on theſe ſubjects, it is no wonder that all our language is alſo derived from it. Force, power, preſſure, action, re-action, reſiſtance, impulſion, are, without any exception, words immediately expreſſive of our own exertions, and applied metaphorically to the phenomena of matter and motion.

Laſtly, when we ſee a body in motion diſplace another body by hitting it, and endeavour to form a notion of the way in which this motion is immediately produced, fixing our attention on what paſſes in the very inſtant of the change, we find ourſelves ſtill obliged to ſuppoſe the thing we call preſſure. We can have no other conception of it; and there is no violence in this act of the imagination. For we know, that if we are joſtled from our place, and forcibly driven againſt another perſon, we put that perſon in motion without any intention or action of our own; and we experience, in doing this, that the very ſame feelings of touch and preſſure are excited as in the inſtances of the ſame motions produced by exerted preſſion. We alſo ſee, that when a body ſtrikes another, and puts it in motion, it makes an impreſſion or dimple in it if ſoft, or breaks it if brittle; and in ſhort, produces every effect of preſſure. A ball of ſoft clay makes a dimple in the ball of ſoft clay which it diſplaces, and is dimpled by it. Springy bodies compreſs each other in their colliſions, and reſile from each other. In ſhort, in every caſe of this claſs, mutual preſſure, indicated by all its ordinary effects, appears to be the intermedium by which the changes of motion are immediately produced; and the previous motion of the ſtriking body ſeems to be only the method of producing this preſſure.

12 Preſſure is the only diſtinct notion of a moving power.

From this copious induction of particulars, and careful attention to the circumſtances of each, we think it plain, that preſſure is the only clear notion that a mind, not familiar with ſcrupulous diſcuſſion, forms of moving power; and therefore that it is very ſingular to think of excluding it from the liſt, and ſaying that impulſion is the only power in nature, and the ſource of all preſſure.

It may perhaps be ſaid, that the mutual immediate action to which the vulgar, and many philoſophers, have erroneouſly given the metaphorical name preſſure is, indeed, the real cauſe of motion or change of motion; but ſtill it is now properly called impulſion, becauſe it is occaſioned only by the previous motion of the impelling body. We conceive clearly, (they may ſay) how this previous motion produces the impulſion. Since matter is impenetrable, we ſee clearly that a ſolid body, or a ſolid particle, cannot proceed without diſplacing the bodies with which it comes into contact; we have notions of this as clear as thoſe of geometry; whereas, how preſſure is produced, is inconceivable by us. If we preſs a ball ever ſo ſtrongly againſt another, and remove the obſtacle which prevented its motion, it will not move an inch, unleſs we *continue* to follow it, and preſs it forward; but we ſee a moving body produce compreſſion, bend ſprings, make pits in ſoft bodies, and produce all the effects of real animal preſſure. Impulſe, therefore, is the true cauſe of motion, and the ſolicitation of gravity is nothing but the repeated impulſe of an inviſible fluid.

But, in the firſt place, let it be obſerved, that both parties profeſs to *explain* the phenomena of mechanical nature, that is, to make them eaſier conceived by the mind. Now it may be granted, that could we have any previous conviction of a fluid continually flowing toward the centre of the earth, we could have ſome notion of the production of a downward motion of bodies, but not more explanation than we have without it, becauſe impulſiveneſs is as little underſtood by us as preſſure.

13
Many preſſures are inexplicable by impulſion.

But there are thouſands of inſtances of moving forces where we cannot conceive how they can be produced by the impulſe of a body already in motion. There appear to be many moving powers in nature, independent of, and inexplicable by, any previous motion; theſe may be brought into action, or occaſions may be afforded for their action, in a variety of ways. The mere will of an animal brings ſome of them into action in the internal procedure of muſcular motion; mere vicinity brings into action powers which are almoſt irreſiſtible, and which produce moſt violent motions. Thus a little aquafortis poured on powdered chalk contained in a bombſhell, will burſt it, throwing the fragments to a great diſtance. A ſpark of fire brings them into action in a maſs of gunpowder, or other combuſtibles. And here it deſerves remark, that the greater the maſs is to which the ſpark is applied, the more violent is the motion produced. It would be juſt the contrary, if the motion were produced by impulſe. For in all caſes of impulſion, the velocity is inverſely proportional to the matter that is moved. When a ſpring is bent, and the two ends are kept together by a thread, a preſſure is excited, which continues to act as long as the thread remains entire. What contrivance of impelling fluid will *explain* this, or give us any conception of the total ceſſation of this preſſure, when the thread is broken, and the ſpring regains its quieſcent form?

14
All preſſures do not produce a ſenſible motion.

We can explain, in a moſt intelligible manner, why the hardeſt preſſure produces no ſenſible motion in the caſe referred to above. We can conceive, with ſufficient diſtinctneſs, a tube filled with ſteel wires, coiled up like cork ſcrews, and compreſſed together into $\frac{1}{10}$th of their natural length. A tube of 10 inches long will contain 100 of them. While in this ſtate, compreſſed by a plug, we can ſuppoſe each of the ſprings to be tied with a thread. Suppoſe now that the thread of the ſpring next the piſton is burnt or cut; it will preſs on the piſton, and force it out, accelerating its motion till it has advanced one inch; after this, the piſton will proceed with a uniform motion. It is plain, that the velocity will be moderate, perhaps hardly ſenſible, becauſe the preſſure acted on it during a very ſhort time. But if two ſprings have been ſet at liberty at the ſame inſtant, the preſſure on the piſton will be continued through a ſpace of two inches, and the final velocity will be greater, becauſe the ſame (not a double) preſſure will be exerted through a double ſpace. Unbending four ſprings at once, will give the piſton a double velocity (See DYNAMICS, *Suppl.* n° 95). Now the effect of the motion of the ſecond ſpring is to keep the preſſure of the firſt in action during a longer time, by following it, and keeping it in a ſtate of compreſſion. There is nothing ſuppoſed of this kind in the caſe of ſtrong preſſure alluded to; and therefore no motion is produced when the obſtacle is removed, except what the inſenſible compreſſion produces by accelerating the body along an inſenſible ſpace. If all the 100 ſprings are diſengaged at once, the piſton will be accelerated through 100 inches, and will acquire ten times the velocity that one ſpring can communicate (*N. B.* The force expended in moving the ſprings themſelves is not conſidered here).

It is in this way only that the previous motion of the impelling body acts in producing a conſiderable motion. The whole proceſs will be minutely conſidered by and bye.

15
Impulſion is not more clearly conceived than preſſure.

We may now aſk, how it is ſo clear a point, that a ſolid body in motion muſt diſplace other bodies? This ſeems to be the very point in queſtion, Is the affirmative deduced from our notion of ſolidity? What is our notion of ſolidity, and whence is it derived? We apprehend, that even this primary notion is derived from preſſure. It is by handling a thing, and finding that we cannot put our hand into the place where it is without diſplacing it, that we know that it is material. All this is indicated to us by the feeling excited by our preſſure. We feel this property always as an obſtacle; and therefore ſay, that by this property it reſiſts our preſſure. Nay, there are caſes where even the philoſopher prefers this quality to impulſiveneſs as a teſt of matter. To convince another that the jar out of which he has poured the water that filled it is not empty, but full of matter, he dips the mouth of the jar into water, and ſhows, that although he preſs it down till the ſurrounding water is above the bottom of it, the water has hardly gotten half an inch into the jar; there is ſomething there which keeps it out; there is matter in it. He then opens a hole in the bottom of the jar; the water immediately riſes on the inſide of the jar, and fills it. He ſays that the preſſure of the water has driven the matter out by the hole; and he *confirms* the materiality of what is expelled, by holding a feather above the hole; it is agitated, ſhewing that the expelled thing has impulſiveneſs, another property (he ſays) of matter; what filled the jar was air, and air in motion is wind. The philoſopher can exhibit ſome new caſes, where ſomething like impulſiveneſs appears.

A

A ſlender magnet may be ſet on one end, the ſouth pole, for inſtance, and will ſtand in that tottering ſituation. If a perſon bring the north pole of a powerful magnet haſtily near the upper end, it will be thrown down, juſt as it may be blown down by a puff of wind; therefore (ſays the philoſopher) there may be appearances of impulſion, and I may imagine that there is impelling matter; but nothing but matter excludes all other matter from its place: this property, therefore, is the ſureſt teſt of its preſence.

Thus we ſee, that our notion of ſolidity or impenetrability (a name ſtill indicating an obſtacle to preſſure), gives us no clearer conception of the productions of motion by impulſion than preſſure does; for it is the ſame, or indicated by the ſame ſenſations.

16 Motion does not impel by transfuſing inherent force or inherent motion.

The queſtion now ſeems to be reduced to this—Since the ſtrongeſt preſſure of a quieſcent body does not produce motion, or excite that kind of preſſure which is the immediate cauſe of motion, while a body in motion, exciting but a very moderate preſſure (as may be ſeen by the trifling *compreſſion* or dimpling,) produces a very conſiderable motion, how is the previous motion conducive to this purpoſe? The anſwer uſually given is this: A body in motion (by whatever cauſe), perſeveres in that motion by the *inherent force;* when it arrives at another body, it cannot proceed, without diſplacing that body; the nature of the inherent force is ſuch, that none of it is loſt, and that a portion of it paſſes into the other body, and the two bodies inſtantly proceed with the ſame quantity of motion that was in the impelling body alone. This is an exact enough narrative of the general fact, but it gives no great *explanation* of it. If the impelling body perſeveres in its motion, by means of its inherent force, that force is exerted in performing its office, and can do no more. The impelled body ſeems as much to poſſeſs an inherent force; for the ſame marks and evidences of preſſure on both ſides are obſerved in the colliſion. If both bodies are ſoft or compreſſible, both are dimpled or compreſſed. We are as much entitled, therefore, to ſay, that part of the force by which it perſeveres at reſt, paſſes into the other body. But the reſt, or quieſcence of a body, is always the ſame; yet what paſſes into the impelling body is different, according to its previous velocity. We can form no conception how the half of the inherent force of the impelling body is expended by every particle, paſſes through the points of contact, and is diſtributed among the particles of the impelled body: nay, we cannot conceive this halving, or any other partition of the force. Is it a thing *ſui generis*, made up of its parts, which can be detached from each other, as the particles of ſalt may be, and really are, when a quantity of freſh water is put into contact with a quantity of brine? We have no clear conception of this; and therefore this is no elucidation of the matter, although it may be an exact ſtatement of the viſible fact.

17 This involves abſurdities.

Let us take the ſimpleſt poſſible caſe, and ſuppoſe only two particles of matter, one of which is at reſt, and the other moves up to it at the rate of two feet per ſecond. The event is ſuppoſed to be as follows: in the inſtant of contact, the two particles proceed with half of the former velocity. Now this inſtant of time, and this preciſe point of ſpace, in which the contact is made, is not a part of either the time or ſpace before colliſion, or of thoſe after colliſion; it is the boundary between both; it is the laſt inſtant of the former time, and the firſt inſtant of the latter time; it belongs to both, and may be ſaid to be in both. What is the ſtate or condition of the impelling particle in this inſtant? In virtue of the previous motion, it has the determination, or the force, or the power, to move at the rate of two feet per ſecond; but, in virtue of the motion after colliſion, it has the determination or power of moving at the rate of one foot per ſecond. In one and the ſame inſtant, therefore, it has two determinations, or only one of them, or neither of them. And it may, in like manner, be ſaid of the impelled body, that in that inſtant, it was both at reſt, and moving at the rate of one foot per ſecond. This ſeems inconceivable or abſurd.

18 Impulſiveneſs is not an intuitive property of matter,

It is not perhaps very clear and demonſtrable, nor is it intuitively certain, that the moving body or particle muſt diſplace the other at all. All that we know is, that matter is moveable, and that cauſes of this motion exiſt in nature. When they have produced this motion, they have performed their taſk, and the motion is their complete effect. The particle continues in this condition forever, unleſs it be changed by ſome cauſe; but we do not ſee any thing in this condition that enables us to ſay what cauſes are competent to this change and what are not. Is it either intuitive or demonſtrable, that the *mere exiſtence* of another particle is not a ſufficient or adequate cauſe? Is it certain that the arrival at another particle is an adequate cauſe? or can we prove that this will not ſtop it altogether? The only concluſion that we can draw with any confidence is, that "two particles, or two equal bodies, meeting with equal velocities in oppoſite directions, will ſtop." But our only reaſon for this concluſion is, that we cannot aſſign an adequate reaſon why either ſhould prevail. But this form of argument never carries luminous conviction, nor does it even give a deciſion at all, unleſs a number of caſes can be ſpecified, which include *every poſſible reſult.* This can hardly be affirmed in the preſent caſe.

19 But an obſerved fact.

We apprehend, that the next caſe, in point of ſimplicity, has ſtill leſs intuitive or deductive evidence; namely, when bodies meet in oppoſite directions with equal quantities of motion. It is by no means eaſy, if it be at all poſſible, to ſhew that they muſt ſtop. The proof proceeds on ſome notion of the manner in which the impulſion, exerted on one particle, or on a few of each body, namely, thoſe which come into contact, is diſtributed among all the particles. A material atom is moved only when a moving force acts on it, and each atom gets a motion preciſely commenſurate to the force which actuates it. Now, it is ſo far from being clear, how a force impreſſed on one particle of a ſolid body, occaſions an equal portion of itſelf to paſs into every particle of that body, and impel it forward in the ſame direction, that the very authors who aſſume the preſent propoſition as an elementary truth, claim no ſmall honour for having determined with preciſion the moving forces that are exerted on each particle, and the circumſtances that are neceſſary for producing an equal progreſſive motion in each. It was by no means an eaſy problem to ſhew, that the motion of the body (eſtimated by an average taken of the motions of every particle) is preciſely that which is announced by this propoſition. We muſt alſo conſider how this inveſtigation is conducted. It is by aſſuming, that whatever force connects a particle *a* with a particle *b*, or whatever force *a* exerts on *b*, the particle *b* exerts an equal force on *a* in the oppoſite direction—Surely no logician will ſay that this is an intuitive truth. The contrary is moſt diſtinctly conceivable. It was a *diſcovery* of the aſtronomers, that every deflection toward the ſun is accompanied by an equal deflection of the ſun. It was a *diſcovery* that a piece of iron attracts a loadſtone; and it was a *diſcovery* (and we dare not yet affirm it to be without exception) that every action of bodies is accompanied by an equal and contrary re-action. But this is by no means a firſt principle. It is the expreſſion of a moſt generally obſerved fact, a ſum total of knowledge. When received on this authority, it is fully competent to ſolve every caſe of impulſion, independent of all obſcure and illogical doctrines of force inherent in moving bodies, of force of inertia, of communication of motion, &c.

The impoſſibility of conceiving the detachment of part of the *force* inherent in A, and transferring *this* part into B, and the ſimilar impoſſibility of conceiving the imparting to B ſome of the *motion* that was in A, ſhould make us reject any propoſition involving ſuch conceptions, and refuſe its admiſſion as an elementary truth. Much more ſhould we reject a propoſition that obliges us to ſuppoſe that a particle of matter has two determinations, forces, motions, or call them by any other name, in one and the ſame inſtant. One of theſe neceſſarily excludes the other. Indeed this was ſo evident, even to the moſt eminent partizans of the doctrine of the transfuſion of inherent force, and others conſequent on it, that they found themſelves obliged to deny that there was ſuch a thing in the world as a perfectly hard body, in which the motion muſt be inſtantaneouſly changed into another, differing from it by any ſenſible quantity. The exiſtence of perfectly hard bodies is poſitively denied by the celebrated mathematician of Baſle, John Bernoulli, in his Diſſertation on the Communication of Motion, which contended for the prize given by the Academy of Sciences at Paris 1710. His reaſon for this rejection is ſingular, and ſomewhat amuſing. "In the colliſion of perfectly hard bodies, the *conſervatio virium vivarum*, demonſtrated by the moſt eminent mathematician (Mr Leibnitz), to be a law of nature, would be broken without any effect being produced. He does not obſerve, that it is as completely broken by elaſtic bodies in the inſtant of greateſt compreſſion. A Britiſh philoſopher, *nullius addictus jurare in verba magiſtri*, aſked, What will be the caſe of two encountering atoms of matter? Without calling them hard, we muſt conceive that they acquire their changes of motion in the inſtant of mutual contact, and that they acquire them *totally*, being 'ατομοι, indiviſible. No anſwer has been given, or indeed can be given, but what implies the ſame difficulty. From all that has been ſaid, we muſt conclude, that this branch of mechanical philoſophy is not put, by thoſe philoſophers, into the condition of an elementary foundation of clear and demonſtrative ſcience; that the transfuſion or transference, either of force or motion, is not a thing of which we have a diſtinct conception; and that it neceſſarily leads us into very untenable doctrines. Far leſs does it ſeem ſafe for us to confide ſo much in its clearneſs and certainty, as to affirm, that impulſion is the ſole moving force in mechanical nature, and the ſource of what we call preſſure.

All this difficulty and obſcurity has ariſen from our arrogant notion that we are competent judges of firſt *principles;* whereas we muſt acknowledge, that we can only perceive ſuch as are properly related or accommodated to our intellectual powers: theſe powers, being ſpecific and peculiar, cannot judge of principles of the firſt claſs, but of thoſe only that are *ſuitably* compounded. We can never know or comprehend any eſſential property of matter—we can only know the *relative* properties of *ſuch matter as we ſee*.

20
Therefore to be learned only by obſerving nature.

Therefore let us quit entirely the barren and trackleſs fields of abſtraction, and reſt ſatisfied with contemplating *what* the Author of Nature has exhibited to our view, and *ſuch* as he has been pleaſed in his wiſdom to exhibit it. We grant that there are no bodies open to our inſpection which are perfectly hard, receiving finite changes of motion in an inſtant. It has not pleaſed God to put any ſuch within our reach. When God created matter, it was with the purpoſe of forming a beautiful univerſe of this matter. He therefore gave it properties which fitted it for this purpoſe. It is this matter only that he has expoſed to the wondering view of man. Thanks to his bounty, he has alſo given us properties of mind, by which this adaption, when perceived by us, becomes a ſource of dignified pleaſure to the obſerver. A Newton, to whom "*Jovis omnia plena*," a Daniel Bernoulli, were rapt almoſt into ecſtacy by a ſingle atom, when they obſerved how its properties, and only ſuch properties, fitted it for making part of a world, which

> Unwearied, and from day to day,
> Should its Creator's power diſplay.

Let the unhappy La Place conſider theſe properties, which enſure the permanency of the ſolar ſyſtem through ages of ages, as proofs of fataliſm, as qualities eſſential to matter. But this Gallic torch effaces the bloom of life from the univerſe, the expreſſion of the Supreme Mind which ſhines from within; and it ſpreads over the countenance of Nature the ghaſtly paleneſs of univerſal death. But let us Britons rather follow the example of our illuſtrious countryman, and ſolace ourſelves with every diſcovery which tends to quicken our perception of Nature's *animated* charms. Let us liſten to the conjectures of him who had already diſcovered ſo many, and who endeavoured to remove the veil which concealed the reſt.

21
Moving powers are inherent in all matter. Newton's conjecture improved by Boſcovich.

Newton, in his maturity of judgment, after having collected much information from his unwearied experiments in magnetiſm, in chemiſtry, in optics, &c. ſaid, that "he ſtrongly ſuſpected, that, in the ſame manner as the bodies of the ſolar ſyſtem were connected by gravitation, ſo the particles of ſublunary bodies were connected together, and affected each other, by means of forces which acted at ſmall, and, in many caſes, inſenſible diſtances; producing the phenomena of coheſion, in all its forms of hardneſs, elaſticity, ductility, ſoftneſs, fluidity, by which their mechanical actions on each other were modified and regulated." Father Boſcovich, one of the firſt mathematicians of Europe, was the firſt who gave this conjecture of Newton's, ton's the attention that it ſo highly deſerved. Other writers, indeed, ſuch as Keill, Freind, Boerhaave, &c. took occaſional notice of it, and even made ſome uſe of it in their attempts to explain ſome complicated phenomena of nature. But they were ſo careleſs in their employment of Newton's conjecture, ſo completely neglected his cautious manner of proceeding, indulged ſo wantonly in hypothetical aſſumptions, and reaſoned ſo falſely from them, that they brought his conjecture into diſcredit. Boſcovich, on the contrary, copied Newton with care, and ſecured his progreſs as he advanced, by the aid of geometry; eſtabliſhing a ſet of uncontrovertible propoſitions, which muſt be the inevitable reſults of the premiſes adopted by him. He then proceeded to compare theſe with the phenomena of nature; and he ſhews that the coincidence is as complete as can be deſired. All this is done in his *Theoria Philoſophiæ Naturalis*, firſt publiſhed at Vienna in 1759. We have given a very ſhort account of it in the article Boscovich, *Suppl.*; but it hardly goes beyond the enunciation of the general principle, and the indication of its applicability to the purpoſes intended. His application to the production of motion by the colliſion of bodies, is peculiarly ſatisfactory. But as the work is written chiefly with the view of gaining the approbation of perſons well inſtructed in natural philoſophy, it can hardly be called an elementary work, or be employed for the inſtruction of perſons entering on the ſtudy. We ſhall attempt to explain this important law of mechaniſm in a way that will give our readers a diſtinct notion (and, we apprehend, a juſt one) of the procedure of Nature in all the caſes of impulſion *that we can obſerve*. We hope to do this, by conſidering the changes of motion produced by moving bodies in a certain ſeries of familiar caſes, where the procedure of nature may be diſtinctly obſerved, and where it is uniformly conceived by every ſpectator; and which will gradually lead the mind to thoſe caſes where the procedure is not obſerved with diſtinctneſs; but the ſimilarity to the former caſe is concluded by ſo fair analogy, that we imagine no perſon will controvert it. We ſhall begin by attending to the manner in which two magnets in motion affect each other's motions; a phenomenon that is familiarly known in the general, although, perhaps, few perſons have attended to it minutely.

Plate xxix.
22
Examination of the mutual actions of magnets.

Let us, therefore, ſuppoſe two magnets, A and B (fig. 1.) equal in weight (in the firſt inſtance). Let them be made to float on water, by placing them on pieces of cork. Let them be placed with their north poles touching each other. Let A be held faſt, and let B be at liberty to move. We know that it will gradually recede from A, with a motion that would continually accelerate, were it not for the reſiſtance of the water. What is the inference drawn from this appearance? Surely this, that either a moving power, inherent in A, repels B, or that B avoids A, by an evaſive power inherent in itſelf. It is immaterial for our purpoſe which opinion we adopt. Let us ſay that A repels B. This admits more conciſe language than the other. If we prevent this motion of B by means of a very ſlender ſpring applied to its remote end, we ſhall obſerve that the ſpring is bent back a little, juſt as if we were puſhing away the magnet gently with the finger; and we obſerve, that the bending of the ſpring is ſo much the greater as B is nearer to A. We can judge of the intenſity of the force by which B is actuated, by the bending of the ſpring—This force is equal to the *weight* of any body that will bend the ſpring to the ſame degree. This force is analogous, therefore, to the weight, the preſſure of gravity, and we may call it a preſſure, and meaſure it by grains weight. Every force that can bend a ſpring will move a body. This is a well known fact. Therefore it is next to certain, that it is this force which cauſes B to recede from A; nay, if we compare the motion of B with what *ſhould* reſult from the action of a force having this very intenſity, and varying in the ſame manner by a change of diſtance from A, taking in the diminution which the reſiſtance of the water muſt occaſion, we ſhall find the motions preciſely the ſame. All this can be diſcovered by Dynamics, n° 95, &c. Therefore we muſt conclude that this, and no other, is the cauſe of the receſs of B.

If, inſtead of placing B in contact with A, we place it at a diſtance from it, and puſh it toward A with an initial velocity, ſomewhat leſs than it would have acquired in that place by its receſs from A, we ſhall find that it will approach A with a motion gradually retarded, till it ſtop at a ſmall diſtance from A; and will now recede from it again with an accelerated motion. In ſhort, we ſhall find that its whole motion to and from A is preciſely the ſame with what reſults from a ſimilar computation by n° 95. of Dynamics.

The whole of this phenomenon is conceived by every beholder, who has not imbibed ſome peculiar theory of a ſtream of impelling fluid, as the indication and effect of a repulſive force exerted by A on B, or of a quality of B, by which it recedes from A.

If now B be held faſt, and A be ſet at liberty, it is obſerved to be repelled by B, or to recede from B, in the ſame manner, and with the ſame force.

Thus, the two magnets appear to affect each other's motions, and are thought, and ſaid, by all to repel each other. The effect appears curious, but excites no farther thought in moſt minds: it is only the ſpeculatiſt that begins to ſuſpect that he has not conceived it properly.

Now, let us ſuppoſe that B is afloat on the ſurface of the water, and at reſt; and that A is puſhed towards it, by a ſingle ſtroke, cauſing it to move ſo moderately that it ſhall not ſtrike B, but have its motion deſtroyed by the repulſion before it reaches it; and let us farther ſuppoſe, that the initial velocity of A was exactly meaſured—the fact will be as follows. As ſoon as A comes within a certain diſtance of B, its motion begins to be affected; it gradually diminiſhes, and at length it ceaſes entirely, and A remains ever after perfectly ſtill. But it is alſo obſerved, that in the inſtant that A ſlackens its motion, B begins to move; that it gradually accelerates in its motion, and at laſt acquires the initial velocity of A, with which it proceeds, till the reſiſtance of the water brings it to reſt, perhaps at a conſiderable diſtance from A. This experiment is very amuſing, and the initial velocity of A may be increaſed in each ſucceeding trial, till at laſt it ſtrikes B. Even then the general appearance remains the ſame: A is brought to reſt and remains at reſt, neither reſiling nor advancing forward; and B moves off with the initial velocity of A. What we wiſh to be particularly noticed is, that as long as the initial velocity of A is leſs than a certain quantity (depending on the ſtrength of the magnets), the motion is communicated to B, or, to expreſs it more cautiouſly, motion is produced in B, without any thing happening that can get the name of impulſion with propriety. In the ordinary conceptions and language of mankind, impulſe always ſuppoſes actual contact; and impulſion is equivalent to a blow or a ſtroke. Both of theſe are indeed metaphorical terms, as well as impulſion. Perhaps the word "to hit," expreſſes this particular caſe more purely, and it is perhaps without any figure, and is the appropriate word. We do not ſpeak at preſent of the conception and language of philoſophers, but of perſons taking an unconcerned view of things, without any intention of ſpeculating farther about the matter.

Appearances perfectly ſimilar are obſerved in electrified bodies. If we hang two equal bunches of very light downy feathers by two equal linen threads, ſo as to hang cloſe by each other like pendulums without touching, and if, after having electrified them ſo that they repel each other to ſome diſtance, we draw one of them, which we ſhall call A, conſiderably aſide from the perpendicular, and then let it go to ſwing like a pendulum; we ſhall obſerve, that inſtead of accelerating till it reach the loweſt point of its vibration, its motion will be retarded; it will ſtop entirely when its thread is perpendicular, and will remain at reſt. In the mean time, the other bunch B will acquire motion, which will gradually increaſe till it equal the motion of A in its maximum ſtate; and with this it would proceed for ever, were it not riſing like a pendulum in the arch of a circle. The general fact is the ſame as in the caſe of the magnets. The moving body is brought to reſt, in which ſtate it continues, and the quieſcent body moves off with an ultimate velocity, equal to the initial velocity of the other; and all this happens without contact or impulſion, but is produced by the mutual repulſion of the electrified bodies.

If this general fact be compared with what happens in the colliſion of two billiard balls, it will be found perfectly ſimilar in every reſpect, but that of the contact and the impulſion, properly ſo called. The impelling ball is brought to reſt, and remains at reſt; and the impelled ball moves off with the velocity of the impelling ball.

This being the caſe, it is plain that we may derive ſome information from the motion of the magnets, that muſt greatly aſſiſt us in our conceptions of what paſſes in the rapid, if not inſtantaneous, production of motion in a billiard ball, by hitting it with another. In the caſe of the magnets, we perceive, and can diſcriminate, a progreſſive train of changes, which terminate in a final change, perfectly ſimilar to the change in the impulſion of the billiard ball. This will juſtify a very minute attention to, and ſtatement of, all the circumſtances.

23
Firſt caſe. A moving toward B at reſt.

Let us attend to the proceſs of this operation, and the production of motion in the magnet originally at reſt, and the abolition of it in the one originally in motion; and let us reflect on what paſſes in our minds when we try to explain it to ourſelves. The trials mentioned at firſt, when one magnet was held faſt, ſhew us that each magnet repels or avoids the other, and that this action is found to be equal on both ſides, producing equal compreſſion of the ſpring employed for aſcertaining the intenſity of this repulſion when the diſtances are the ſame. This is the fact. It is no leſs a fact, that equal moving forces, ſuch as equal preſſures muſt be ſuppoſed to be, produce equal changes of motion in their own direction. Therefore, as ſoon as A comes to ſuch a diſtance from B that the mutual action takes place, both magnets are affected, and equally affected; that is, equal changes of motion are produced on each, but in oppoſite directions. The motion of A is diminiſhed, perhaps $\frac{1}{100}$th part, in $\frac{1}{10}$th of a ſecond, and (let it be carefully remembered) while A paſſes over a certain ſpace, ſuppoſe the 10th of an inch. During this ſmall portion of time, B acquires as much motion as A loſes. This is not the motion loſt by A. This is inconceivable; for motion is not a thing, but a condition. But it is an *equal degree* of motion. B has paſſed over a ſmall ſpace during this time, perhaps the 50th part of an inch, with an almoſt imperceptible motion, that is gradually accelerated from nothing. Since A is moving faſter than B, it muſt ſtill gain upon it; and therefore the mutual repulſion will increaſe; and in the next 10th of a ſecond this force will take another and greater portion of A's original velocity from it, and will add a greater velocity to that already acquired by B. And thus, in every ſucceeding minute portion of time, the motion of A will be more and more diminiſhed, and that of B as much increaſed, by the equal, though continually increaſing, ſimultaneous repulſions acting in oppoſite directions. It is evident, that it is poſſible that the velocity of A may be ſo much diminiſhed, and that of B ſo much increaſed, that the remaining velocity of A ſhall be juſt equal to the acquired velocity of B. Till this happens, the diſtances of the magnets have been continually diminiſhing; for A has been moving faſter than B, and gaining on it. If the operation of the mutual repulſions could be ſtopped at this inſtant, both magnets would move forward for ever with equal velocities.

24
They acquire a common velocity *x*;

It is of particular importance to know what this common velocity is. This is determined by our previous knowledge, that the magnets repel or avoid each other with equal forces. Theſe forces may vary by a variation of diſtance; but the force acting on A is always equal and oppoſite to the force acting at the ſame time on B. This is the uncontroverted fact (the authority for which ſhall ſoon be conſidered). Theſe equal forces muſt therefore produce equal and oppoſite changes of motion. The motion acquired by B is equal to that loſt by A. But the magnets being ſuppoſed equal, and moving with equal velocities, they have equal quantities of motion. Therefore the motion acquired by B, or that loſt by A, is equal to what remains in A; that is, A has loſt half of its motion, and therefore half of its velocity; or the common velocity is half of the primitive velocity of A.

It was for the ſake of a ſomewhat eaſier diſcuſſion that we ſuppoſed the magnets to be of equal weights. But it is almoſt equally eaſy to aſcertain what this common velocity will be in any other proportion of the quantities of matter in A and B. It is a matter of unexcepted experience, that whatever be the weight or ſtrength of two magnets, their actions on each other are always equal. Therefore the ſimultaneous force muſt always produce equal changes of motion in the two bodies. But the change of motion is expreſſed by the product of the quantity of matter and the change of velocity. Therefore let A and B repreſent the quantities of matter in the magnets; and let a be the primitive velocity of A, and x the velocity which obtains when both are moving with one velocity. The velocity loſt by A is $a - x$. Therefore we muſt have $B\,x = A \times \overline{a - x}$, $= A\,a - A\,x$; and $A\,a = A\,x + B\,x$, $= \overline{A + B} \times x$, and $x = \frac{A\,a}{A + B}$. *The common velocity is therefore obtained by dividing the primitive quantity of motion by the ſum of the quantities of matter.*

25 Namely. $x = \frac{A \times a}{A + B}$.

This may be conceived more compendiouſly in another way. Since B acquires as much motion as A loſes, the whole quantity of motion is the ſame as before: Therefore the common velocity muſt be had by dividing this quantity of motion by the whole quantity of matter. But we wiſhed to make the reader keep his attention fixed on the ſteps of procedure, and ſee the connection of each with the cauſes.

We ſhall find that this period of the whole proceſs, namely, the moment when both bodies have acquired a common velocity, and the preciſe magnitude of this velocity, are points of peculiar importance in the doctrine of impulſion; indeed they almoſt comprehend the whole of it.

26 But this does not continue, and the magnets ſeparate.

But this is a ſtate that cannot continue for a moment in the example before us. The repulſive or evaſive forces are ſtill acting on both magnets, and ſtill diminiſh the motion of A, and equally increaſe the motion of B. Therefore the velocity of A, in the very next moment, muſt be leſs than that of B; and B has, during this moment, gained on A, or has removed farther from it. This continues; A is ſtill retarded, and B is accelerated; and therefore gains more and more upon A, or ſeparates farther and farther from it. This muſt continue as long as the mutual repulſions are ſuppoſed to act. If we ſuppoſe that the *ſenſible* action of theſe forces is limited to ſome determinate diſtance, the mutual action will ceaſe when B has got to that diſtance before A. We may call it *the inactive diſtance*. After this, A and B will proceed with the velocities which they have at that inſtant. Let us inquire into theſe final velocities; and thus complete our acquaintance with the proceſs.

27 The common velocity is attained at the inſtant of neareſt approach.

We ſee (and it is important) that the magnets are in their ſtate of greateſt proximity at the inſtant of their moving with a common velocity, and that after this they gradually ſeparate, till they are again at their inactive diſtance. During this ſeparation they attain diſtances from each other equal to what they had during the period of their mutual approach. At theſe diſtances the repulſions are the ſame as before, and act in the ſame direction. Therefore, in each moment of ſeparation, and at each diſtance, A ſuſtains the ſame diminution, and B gets the ſame augmentation of its motion, as when they were at the ſame diſtance in the period of their mutual approach. The ſums total, therefore, of theſe equal augmentations and diminutions muſt be equal to the augmentation and diminution during the approach. Therefore the whole diminution of A's motion muſt be double of the diminution ſuſtained during the approach; and the whole augmentation of B's motion muſt, in like manner, be double of that acquired during the approach of A. Hence we eaſily ſee, that when the magnets are ſuppoſed equal, A muſt be brought to reſt; for in the period of approach it had loſt half of its velocity. It muſt now have loſt the whole. For ſimilar reaſons B muſt finally acquire the primitive velocity of A; for in the inſtant of greateſt proximity, it had acquired the half of it.

28 Repulſion is a cauſe adequate to the obſerved effect.

Thus we ſee, that the equal mutual repulſions are preciſely adequate to the production of the changes of motion that are really obſerved; and muſt therefore be admitted as the immediate cauſes of theſe changes.

29 Effect when the magnets are unequal.

It is equally eaſy to aſcertain the final velocities when the magnets are of unequal ſizes; for the equality of their mutual repulſions is not affected by any inequality of their magnitudes. Their ſeparations, and the changes of motion during theſe ſeparations, will be the ſame with their approaches and the correſponding changes of motion; and the whole change on each will be double of the change ſuſtained at the inſtant of greateſt proximity and common velocity. Hence we learn, that the final velocity of B is $2\,x$, or $\frac{2\,A\,a}{A+B}$; and the final velocity of A is $\frac{\overline{A - B} \times a}{A + B}$. For the primitive velocity of A being a, and the common velocity, in the inſtant of neareſt approach, being $\frac{A\,a}{A+B}$ the loſs of velocity is $a - \frac{A\,a}{A+B}$, $= \frac{A\,a + B\,a - A\,a}{A + B}$, $= \frac{B\,a}{A+B}$. Therefore the final loſs of velocity is $\frac{2\,B\,a}{A+B}$, and the remaining final velocity is $a - \frac{2\,B\,a}{A+B}$, $= \frac{A\,a + B\,a - 2\,B\,a}{A + B}$, $= \frac{\overline{A - B} \times a}{A + B}$.

30 II. Caſe. Both magnets in motion in one direction.

Let us, in the next place, ſee what will be the reſult when both of the magnets are in motion at the beginning of their mutual action. And, firſt, let both move in one direction. Let A, moving with the velocity a, overtake B, moving in the ſame direction with the velocity b, leſs than a. Moreover, let the velocities a and b be ſuch, that their difference $a - b$ is ſomewhat leſs than the ſum of the velocities α and β, which the mutual repulſions of the magnets would generate in them, if the magnets were placed in contact, and allowed to recede from each other till they get beyond their acting diſtance.

Theſe things being premiſed, let the magnets be ſet in motion in the ſame direction with the above-mentioned velocities a and b. The magnet A muſt gain on B, and at laſt come ſo near it, that the mutual repulſions begin to act on both. It is plain, that the motion of A will be diminiſhed, and that of B increaſed, by equal quantities, during every minute portion of the time of their mutual action. It is alſo evident, that the velocity of A may be ſo much diminiſhed, and that of B ſo much increaſed, that they ſhall be rendered equal. Alſo this will happen before the magnets touch one another; becauſe the original difference of their quantities of motion has been ſuppoſed leſs than the motion which the repulſive forces are able to generate or extinguiſh, by acting on them through the whole diſtance which gives occaſion to their action. Therefore the difference of the velocities is leſs than the ſum of the velocity α, which the mutual repulſion can take from A, and the velocity β, which it can give at the ſame time to B. The magnets will gradually approach, and the mutual repulſions, and conſequent diminution of A's, and augmentation of B's motion, will gradually increaſe, till the ſum of α and β is juſt equal to the difference of a and b; that is, till the bodies are moving with one velocity. If the mutual repulſions were annihilated at this inſtant, the bodies would move forward with this common velocity. What this is we determine with great facility, as we did in the former caſe: Becauſe the repulſions produce equal and oppoſite changes of motion in the magnets, as much is taken from $A \times a$ as is added to $B \times b$; and the ſum of $A \times a$, and $B \times b$, is equal to the ſum of $A \times x$ and $B \times x$, or $\overline{A+B} \times x = A \times a + B \times b$, and $x = \frac{Aa+Bb}{A+B}$. Therefore *the common velocity is had by dividing the ſum of the primitive quantities of motion by the ſum of the quantities of matter.*

31 Common velocity $= \frac{Aa+Bb}{A+B}$ but the magnets ſeparate, and the change is doubled in each.

But the repulſive forces continue to act as in the former caſe. The motion of A is ſtill more diminiſhed, and that of B augmented: Therefore the velocity of B muſt now exceed the velocity of A, and the magnets muſt ſeparate. Reaſoning in the ſame way as in the former caſe, it is evident that the mutual action does not ceaſe till the magnets have ſeparated to their inactive diſtance from each other, and that the whole change of motion in each is double of the change that it had ſuſtained when they were in their greateſt proximity, and moving with a common velocity. Theſe conſiderations enable us to aſcertain the final ſtate of each. The common velocity is $\frac{Aa+Ab}{A+B}$. Therefore the change made on the velocity of A, at the inſtant of greateſt proximity, is $a - \frac{Aa+Bb}{A+B}$, or $= -\frac{B\times\overline{a-b}}{A+B}$, and the final velocity of A is $a - \frac{2B\times\overline{a-b}}{A+B}$. In like manner, the change produced on the velocity of B is $= \frac{Aa+Bb}{A+B} - b$, or $= + \frac{A\times\overline{a-b}}{A+B}$, and the final velocity of B is $b + \frac{2A\times\overline{a-}}{A+B}$. We may alſo obtain the final velocity of each, by taking its initial velocity from twice the common velocity.

If, in this example of two magnets in motion, we ſuppoſe them of equal weight, we ſhall find that they will finally proceed with exchanged velocities. For when A = B, it is plain that $a - \frac{2B\times\overline{a-b}}{A+B}$ is $= a - 1 \times \overline{a-b}, = a - a + b, = b$: and $b + \frac{2A\times\overline{a-b}}{A+B}$ is $= b + 1 \times \overline{a-b}, = b + a - b, = a$. This caſe is eaſily ſubjected to experiment, and will be found fully confirmed, if we take into account the retardations occaſioned by the reſiſtance of the water to the motions.

32 Magnets moving in oppoſite directions.

Let us, in the next place, ſuppoſe the magnets to be moving in oppoſite directions with the velocities a and b; and (in order that the magnets may not ſtrike each other) let the ſum of a and b be leſs than the ſum of α and β, which the repulſions of the magnets would produce by repelling them from contact to their inactive diſtance.

As ſoon as the magnets arrive at their acting diſtance, their mutual and equal repulſions immediately begin to diminiſh both of their motions; and in any minute portion of the period of their approach, equal quantities of motion are taken from each. It is evident, that if the primitive quantities of motion have been equal; that is, if A and B have been moving with velocities reciprocally proportional to their quantities of matter, then, when the motion of one of them has been annihilated by their mutual repulſion, the motion of the other will be deſtroyed at the ſame time, and both will be brought to reſt. Were the repulſions annihilated at this inſtant, they would remain at reſt. But becauſe thoſe forces continue their actions, the magnets will ſeparate again, regaining, at every diſtance, the velocity which they had, when at that diſtance, during their mutual approach; and when they have reached their inactive diſtance, they will have regained each its original momentum and velocity, but in the oppoſite direction. This needs no farther comment; but muſt be kept in mind, becauſe this caſe has a preciſe counterpart in the colliſion of ſolid bodies, meeting each other in oppoſite directions with equal momenta. But if the momentum of one exceed that of the other, thus, if $A \times a$ be greater than $B \times b$, then, when the magnet B is brought to reſt, A has ſtill a momentum remaining equal to $Aa - Bb$. Having therefore a certain velocity, while B has none, it muſt approach ſtill nearer to B, and a ſtill greater repulſion will be exerted on B than if A had alſo been brought to reſt, but ſtill repelling B. Since B is now acquiring motion in the direction oppoſite to its former motion, and A is ſtill loſing motion, a time muſt come when the motion of A is ſo much diminiſhed, and that of B ſo much augmented, that they are moving with a common velocity in the direction of A's primitive motion. The reaſoning employed in the foregoing examples ſhews us, that, in the preſent caſe alſo, this ſtate of common velocity is alſo the ſtate of the greateſt proximity, and that the magnets ſeparate again, till they attain their diſtance of inaction, and that the total change in each is double of what it was in their ſtate of greateſt proximity.

33 Common velocity $= \frac{Aa-Bb}{A+B}$; but the change is doubled by the ſubſequent ſeparation.

To find this common velocity, recollect, that when the momentun of B was extinguiſhed, that of A was ſtill $= Aa - Bb$. From what has been already ſaid on the other caſes, we know that when the common velocity obtains, the whole momenta are ſtill equal to $Aa - Bb$. Therefore the common velocity x muſt be $= \frac{Aa-Bb}{A+B}$.

The velocity loſt by A muſt therefore be $a - \frac{Aa-Bb}{A+B}, = \frac{B\times\overline{a+b}}{A+B}$, and the final velocity will be $a - \frac{2B\times\overline{a+b}}{A+B}$. The final motion of A will be in the ſame direction as at firſt, if a be greater than

$\frac{2\,B\,\overline{a+b}}{A+B}$, otherwiſe it will be in the oppoſite direction.

In like manner, the change of velocity in B is $b + \frac{A\,a - B\,b}{A+B}$, becauſe the former velocity b is deſtroyed, and the new velocity is $\frac{A\,a - B\,b}{A+B}$ in the oppoſite direction. This is $= \frac{A \times \overline{a+b}}{A+B}$, and the final velocity of B is $= b - \frac{2\,A \times \overline{a+b}}{A+B}$.

34 The changes of motion in the magnets are ſimilar to thoſe in the colliſion of bodies.

Thus we have ſhewn, in the caſe of magnets acting on each other by repulſive forces, or actuated by forces equivalent to repulſive forces, how changes of motion are produced, which have a great reſemblance to thoſe which are ſeen in the colliſion of ſolid bodies. The motions which obtain in the inſtant of greateſt proximity are preciſely ſimilar to what *are obſerved* in the colliſion of unelaſtic bodies. Their common velocity after colliſion is always $= \frac{A\,a + B\,b}{A+B}$, or $= \frac{A\,a - B\,b}{A+B}$, according as the bodies were moving in the ſame or in oppoſite directions. The final motions of the magnets are alſo preciſely ſimilar to what *are obſerved* in the colliſion of perfectly elaſtic bodies. We took the inſtance of magnets, becauſe the object is familiar; but we can ſubſtitute, in imagination, an abſtract repulſive force in place of magnetiſm, and we can aſſign it any intenſity, and any law and limits of action we pleaſe. We can imagine it ſo powerful, that although its action be limited to a very ſmall, and even inſenſible diſtance, it ſhall always reduce the meeting bodies to a common velocity before they come into actual contact; and therefore without any real impulſion, as impulſion is commonly conceived.

There are ſome farther general obſervations that may be made on thoſe motions which are of importance.

35 Theſe changes are proportional to the relative motion.

1. We ſee that the changes of motion, and conſequently the actions, are dependent on the relative motions only, whatever the abſolute motions may be: For changes are always as $a - b$ when the bodies are moving in one direction, and as $a + b$ when they are moving in oppoſite directions. Now $a \pm b$ is the relative motion.

36 And reciprocally as the quantities of matter.

2. The change of velocity in each of the two bodies is inverſely as its quantity of matter, or is proportional to the quantity of matter in the other body. The changes in A and B are $\frac{B \times \overline{a \pm b}}{A+B}$ and $\frac{A \times \overline{a \pm b}}{A+B}$. The changing forces being equal on both ſides, produce equal changes in the quantities of motion; and therefore produce changes of velocity that are inverſely as the quantities of matter.

37 Conſervatio Momentorum.

3. During the whole proceſs, the ſum of the momenta, or quantities of motion, remains the ſame, if the bodies are moving in one direction: if they are moving in oppoſite directions, it is the difference of momenta that remains the ſame; for in every inſtant of the proceſs equal changes of momentum are made in oppoſite directions. When the motions are in the ſame direction, as much is taken from the one as is added to the other; and therefore the *ſum* remains unchanged. When the motions are in oppoſite directions, equal quantities are taken from both; and therefore the *difference* remains unchanged. This is called the CONSERVATIO MOMENTORUM; and it is uſually enunciated by ſaying, that the quantity of motion, eſtimated in one direction, is not changed by the equal and oppoſite actions of the bodies. This is a particular caſe of a general law affirmed by Des Cartes, that the quantity of motion in the univerſe remains always the ſame when eſtimated in *any* one direction.

38 Conſervatio Virium vivarum.

4. When the whole proceſs is completed, the ſum of the products made by multiplying each body by the ſquare of its final velocity, is equal to the ſum of the products made by multiplying each body into the ſquare of its initial velocity. For when the proceſs is completed, the two bodies are at the ſame diſtance from each other as when the mutual action began. Therefore, during the proceſs, each body has paſſed over an equal ſpace, and in every ſimilar point it has been acted on by an equal force (although this force be different in different points of this ſpace). Therefore, in every inſtant, the ſimultaneous products of the quantity of matter by the momentary variation of the ſquare of the velocity are equal on both ſides; and therefore the products of the quantity of matter by the whole change of the ſquare of the velocity are alſo equal on both ſides. See DYNAMICS, *Suppl.* n° 95. and 110. where $v\dot{v} = \frac{f\dot{s}}{m}$; and therefore $m\,v\,\dot{v} = f\,\dot{s}$, and $m \times V^2 - v^2$, or $n \times v^2 - V^2 = \int f\dot{s}$. Now, ſince theſe changes are in oppoſite directions, as much is added to one product as is taken from the other, and the ſum of the products of the quantities of matter by the ſquares of the final velocities, is equal to the ſum of the products of the ſame quantities of matter by the ſquares of the initial velocities.

Theſe two theorems are not principles, but general facts.

This is a particular caſe of the famous CONSERVATIO VIRIUM VIVARUM, claimed as a mighty diſcovery by the partizans of Leibnitz, and aſcribed to him; but he has no claim whatever to the diſcovery. It was communicated to the Royal Society of London in 1668 by Huyghens, as one of the general laws of impulſion, obtaining in what he calls *hard bodies*. Several of the Leibnitzian ſchool, indeed, extended it farther than Huyghens had done; ſome of them indeed very lately. The obſervation of this general law was ſoon applied to many excellent purpoſes in the ſolution of very intricate problems; becauſe it often ſaved the trouble of tracing the intermediate ſteps of a complicated proceſs. Aſſured that theſe products were invariable, the mathematician found it an eaſy matter to ſtate what conditions of the queſtion inſured this equality of products; and thus the problem was ſolved. In this manner Daniel Bernoulli gives moſt elegant ſolutions of ſome, otherwiſe almoſt intractable, problems in Hydraulics. For ſuch reaſons, as a mighty aid in mechanical inveſtigation, the diſcovery of Huyghens is extremely valuable. Its merit in this reſpect is perfectly ſimilar (though perhaps ſomewhat greater) to Des Cartes's obſervation of the *conſervatio momentorum*. It is alſo like the obſervation or diſcovery of Maupertuis, which he calls *the law of ſmalleſt action* (indeed it is the ſame under a different aſpect), or La Grange's *law of virtual velocities*, or D'Alembert's *law of equilibrium of action*;—all of theſe are general facts, laws by which the changes of motion are *obſerved* to proceed. But their authors have vaunted them as principles, as cauſes, from which to conclude effects; whereas they are really inductions from particular inſtances. We muſt alſo obſerve, that this law of *conſervatio virium vivarum* was not deduced either by Huyghens or any of the Leibnitzian ſchool, by reaſoning from more general principles. It was an expiſcation of ſameneſs in events, diverſified by other circumſtances. We do not recollect any author who has given what can be called a demonſtration of it, deducing it from principles or laws ſtill more general. We apprehend, that the preſent caſe of its truth has been ſo demonſtrated by us. The *principle* is, that "a moving force is to be meaſured by the change of motion produced by it:" And the law to which this principle is applied is, that "the mutual repulſions of magnets are equal and oppoſite;" and the application is made by means of the "39th propoſition of the firſt book of Newton's *Principia*." Our principle, which is the ſame with Sir Iſaac Newton's ſecond law of motion, is really an axiom of human thought. The propoſition is the conſequence logically drawn from this axiom; and the law of magnetiſm is an obſerved fact. We hope to ſhew by and bye, that this propoſition, which is our n° 95 of Dynamics, is found to obtain in *every* inſtance that has been or can be given of the *conſervatio virium vivarum*, and that this *conſervatio* is only another way of expreſſing the propoſition. Having done this, we ſhall not think ourſelves chargeable with vanity when we ſay, that we have given the firſt demonſtration of this famous law. We cannot refuſe ourſelves ſome ſatisfaction at having done this; becauſe it has been ſo highly eſteemed, chiefly for the ſupport derived from it for the Leibnitzian meaſurement of the force of moving bodies by the *ſquare of the velocity* which it communicates; whereas it is the logical conſequence of the force being proportional to the *ſimple velocity*. We have only taken a weapon out of the hands of a plunderer, and reſtored it to its lawful owner, Sir Iſaac Newton. *Non ita certandi cupidus, quam propter amorem:* For we muſt ſay,

> *Tu pater et rerum inventor, tu patria nobis*
> *Suppeditas precepta, tuiſque ex, inclute, chartis*
> *Floriferis ut apes in ſaltibus omnia libant,*
> *Omnia nos itidem depaſcimur aurea dicta*
> *Aurea, perpetuâ ſemper digniſſima vitâ.*

We truſt that our reader will not think that this minute diſcuſſion of the mutual actions of magnets or other repelling bodies, in which we have engaged him, has been thrown away, ſince it has enabled us to apprehend clearly a caſe of two ſuch general laws as the *conſervatio momentorum*, and the *conſervatio virium vivarum*.

39
Vis viva loſt in the colliſion of unelaſtic bodies.

5. In the moment of greateſt vicinity and common velocity, there is a certain determinate loſs of the *vires vivæ*, or products of the matter by the ſquare of the velocity; and this loſs is proportional to the ſquare of the relative motion. The *vires vivæ*, at the commencement of the mutual action, are $= Aa^2 + Bb^2$ (I.). In the moment of greateſt proximity, the quantity of matter $A + B$ is moving with the common velocity $\frac{Aa + Bb}{A + B}$; therefore the *vires vivæ* are $= \overline{A+B} \times \frac{\overline{Aa + Bb}^2}{\overline{A + B}^2} = \frac{\overline{Aa + Bb}^2}{A + B}, = \frac{A^2a^2 + B^2b^2 + AB \times 2ab}{A + B}$ (II.).

$$\text{I.} \times A + B = A^2a^2 + B^2b^2 + AB \times a^2 \times b^2.$$
$$\text{II.} \times A + B = \underline{A^2a^2 + B^2b^2 + AB \times 2ab.}$$
$$\text{Difference} \quad - \quad - \quad - \quad AB \times \overline{a - b}^2.$$

Loſs of *vis viva* $= \frac{AB}{A + B} \times \overline{a - b}^2$, a quantity that is proportional to $\overline{a - b}^2$, the ſquare of the relative velocity $a - b$.

Had the bodies been moving in oppoſite directions then (II.) $\times \overline{A + B}$ would have been $A^2a^2 + B^2 - AB \times 2ab$, and the difference from $\overline{Aa^2 + Bb^2} \times A + B$ would have been $= AB \times \overline{a + b}^2$, proportional to the ſquare of the relative velocity $a + b$.

Phyſical cauſe of this loſs.

Such is the fact; and we ſhall find it of importance in the great debate about the force of moving bodies. Let us inquire into the phyſical or mechanical cauſe of it. In the moment of common velocity, the bodies are nearer to each other than they are at the beginning and at the end of their mutual action. Therefore (when they are moving in one direction) the body A, which follows, has been retarded through a ſpace which is greater than the ſpace along which the preceding body B has been accelerated. But, becauſe the ſimultaneous forces acting on the bodies along theſe unequal ſpaces are always equal, the area which meaſures the diminution of the ſquare of A's velocity (Dynamics, n° 95.) muſt exceed the area which expreſſes the augmentation of the ſquare of B's velocity, and there muſt be a loſs of *vires vivæ*. Now, we learned above, that the mutual action is the ſame when the relative velocity is the ſame; and therefore the approximation, which is the occaſion of this action, muſt be the ſame. And it is demonſtrated in Dynamics, n° 95. that the area, whoſe abſciſſa is the ſpace deſcribed, and ordinates the forces, expreſſes the ſquare of the generated or extinguiſhed velocity. This is evidently the relative velocity of the bodies, becauſe they are brought to a common velocity in the inſtant of greateſt proximity; that is, their relative velocity is deſtroyed.

40
The motion of the common centre of gravity is not changed by the mutual action.

6. During the whole proceſs, the common centre of poſition or gravity (A) is moving uniformly with the velocity

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(A) See the article Position in this *Supplement;* where it will be demonſtrated, that the centre of gravity (determined in the uſual manner) is the point by whoſe ſituation and motion we eſtimate with the greateſt propriety the ſituation and motion of the aſſemblage, of which it is the centre: it is therefore called the centre of position. The reader is only deſired at preſent to recollect, that the centre of gravity, or poſition of two bodies, is ſituated in the line joining their centres; and that its diſtance from each is inverſely as their quantities of matter; and that the diſtance and motion of the centre is the medium or average of all the diſtances or motions.

velocity $\frac{\mathrm{A}a \pm \mathrm{B}b}{\mathrm{A}+\mathrm{B}}$. For the motion of the centre of poſition is the average of the motion of every particle of matter in both bodies. A*a* is the ſum of the motions of every particle of matter in A, and B*b* is the ſum of the motions of every particle in B, before the mutual actions began. Therefore $\mathrm{A}a + \mathrm{B}b$ is the whole motions when the bodies are moving in the ſame direction with their different velocities. The number of particles is $\mathrm{A}+\mathrm{B}$: Therefore, if the whole motions be equally divided among all the particles, the velocity of each muſt be $\frac{\mathrm{A}a+\mathrm{B}b}{\mathrm{A}+\mathrm{B}}$. This is the average motion, or the motion of the centre of poſition, deduced from the notion we wiſh to impreſs of the character of this centre, as the index of the poſition and motion of any aſſemblage of matter. This velocity may be deduced more eaſily from its geometrical property. It is a point ſo ſituated between A and B, that its diſtance from each is reciprocally proportional to the quantities of matter in A and B, as is well known of the centre of gravity. It is equally plain, that when the bodies are moving in oppoſite directions, the average velocity *x* muſt be $=\frac{\mathrm{A}a-\mathrm{B}b}{\mathrm{A}+\mathrm{B}}$. Thus we ſee that the motion of the centre of poſition, before the magnets have begun to act on each other, is the ſame with its motion when their mutual repulſion is the greateſt; namely, at the moment of their greateſt vicinity. It has continued the ſame during the whole proceſs: for we have already ſeen, that the ſum or difference of the momenta, or $\mathrm{A}a \pm \mathrm{B}b$, remained always the ſame; conſequently $\frac{\mathrm{A}a \pm b}{\mathrm{A}+\mathrm{B}}$, or *x*, the motion of the centre, remains always the ſame. Therefore the propoſition is demonſtrated. It is, indeed, a truth much more general than appears in the preſent inſtance. *If any number of bodies be moving with any velocities, and in any directions, the motion of the centre of poſition is not affected by their mutual, equal, and oppoſite, actions on each other.*

41
The motions, in relation to the centre, are reciprocally as the bodies.

7. During the whole motion, the motion of the bodies relative to each other, is to the motion of one of them, relative to the centre of poſition, as the ſum of the bodies is to the other body: For when they were moving with a common velocity, this velocity was the ſame with that of the centre; and they are then at reſt, relative to each other, and relative to the centre. And becauſe their diſtances from the centre are inverſely as the bodies, their changes of diſtance, that is, their motions relative to the centre, are in the ſame proportion; and the ſum of their motions relative to the centre is the ſame with their motions relative to each other. Therefore $\mathrm{A}+\mathrm{B} : \mathrm{A} = a - b$: motion of B relative to the centre. Indeed we ſaw, that in their mutual action, the change of B's motion was $=\frac{\mathrm{A}\times \overline{a-b}}{\mathrm{A}+\mathrm{B}}$, and the change of A's motion was $=\frac{\mathrm{B}\times \overline{a-b}}{\mathrm{A}+\mathrm{B}}$.

42
The bodies ſeparate with the ſame relative velocity which they approached.

Hence we learn, that while the centre moves uniformly, the bodies approach it, and then recede from it, with velocities reciprocally proportional to their quantities of matter. This will be found a very uſeful corollary. We may alſo ſee that their final velocity of mutual receſs is equal to that of their firſt approach, or, their relative motions are the ſame in quantity after the action is over as before it began, but in oppoſite directions.

All theſe general facts, which are diſtinctly appreciable, and very perceivable, in this example of magnets, or electrified bodies, are equally appreciable in all caſes of mutual repulſions, however ſtrong theſe may be; and although the ſpace through which they are exerted ſhould be ſo ſmall as to elude obſervation, and though the whole proceſs ſhould be completed in an inſenſible moment of time.

43
An interpoſed ſpring has the ſame effect with the mutual repulſions.

It ſcarcely needs any comment to make it clear that the very ſame changes of motion muſt take place, if a ſolid body A ſhould come up to another ſolid body B, at reſt, or moving more ſlowly in the ſame direction, or moving in the oppoſite direction; provided that there be a ſpring interpoſed between them, which may hinder A from ſtriking B; for, as ſoon as A touches the ſpring, it begins to preſs it againſt B, and, therefore, to compreſs the ſpring. It cannot carry the ſpring before it, without the ſpring's puſhing B before it. Preſſure on B is required for this purpoſe. This is ſupplied by that natural power which we call elaſticity, which is inherent in the ſpring, whether it be in motion or at reſt. It is not in *action*, but in *capacity, faculty, capability, power*, or by whatever name we may chooſe to expreſs the poſſeſſion. The occaſion required for its exertion is compreſſion. This is furniſhed by the motion of A; for A cannot advance without compreſſing it. This inherent force of the ſpring is *known* to act with perfect equality at both ends, in oppoſite directions. It exerts equal and oppoſite preſſures on A and on B; it diminiſhes the motion of A, and equally augments the motion of B (if both are moving that way). A is retarded, and B is accelerated; A is ſtill moving faſter than B; and therefore the compreſſion and the conſequent reaction of the ſpring increaſes, and ſtill more retards A and accelerates B. After ſome time, both bodies, with the ſpring compreſſed between them, are moving with equal velocities; the ſpring, however, is ſtrongly reacting on both, and muſt now cauſe them to ſeparate; ſtill retarding A and accelerating B—They muſt ſeparate more and more, till the ſpring regain its quieſcent form, and its elaſtic reaction ceaſe entirely. During its reſtitution, its preſſures are the ſame as during its compreſſion; therefore, the whole change produced on each of the bodies muſt be double of what it was when the ſpring was in its ſtate of greateſt compreſſion, and the bodies were moving with a common velocity. In ſhort, the whole proceſs in this example muſt be preciſely ſimilar to that of the magnets in every circumſtance relating to the changes of motion in A and B. The common velocity muſt be $=\frac{\mathrm{A}a \pm \mathrm{B}b}{\mathrm{A}+\mathrm{B}}$. The final velocity of A muſt be $= a - \frac{2\,\mathrm{B}\,\overline{a \pm b}}{\mathrm{A}+\mathrm{B}}$, and that of B muſt be $= b + \frac{2\,\mathrm{A}\,\overline{a \pm b}}{\mathrm{A}+\mathrm{B}}$. The motion of the common centre muſt be unaffected by the action of the ſpring, and the motion of each body, relative to the centre, muſt be reciprocally as its quantity of matter, &c. &c.

44
The changes of motion are produced by the inherent forces which connect the particles.

We apprehend that this proceſs can ſcarcely be called impulſion; A has not ſtruck B. The changes of motion can ſcarcely be aſcribed to forces inherent in A or B, in conſequence of their being in motion. Any perſon, not already warped by a theory, will (we think) aſcribe them to a force inherent in the ſpring; inherent in it, whether at reſt or in motion, and only requiring a *continued* compreſſion as the proper opportunity for its continued exertion. This ſpring may be ſuppoſed to make a part of B, or of A, or of both; and then indeed, the force may be ſaid to be inherent in either, or in both. But it is not the peculiar force inherent in motion, or in moving bodies *only*—it is the force of *elaſticity*, inherent in part of the body, but requiring a continued *compreſſion* for the production of a continued *repreſſion*. The effect of this reaction is modified by the very occaſion of the compreſſion. This may be the elaſticity of another ſpring. In this caſe it will only compreſs that ſpring—It may be the advance of a body in motion; the reaction produces a retardation of that motion; it may be the obſtacle of a quieſcent body—It will give it motion; or, it may be the obſtruction by a body moving more ſlowly away than the ſpring is preſſed forward—it will accelerate that motion. Thus, in all theſe caſes, we cannot help diſtinguiſhing the immediate cauſe of theſe changes of motion from the ſuppoſed force of a moving body. Nay, the proceſs of motion is ſimilar, even when we ſuppoſe that the ſpring is not a thing external to the body, although attached to it; but that the whole body, or both bodies, are ſpringy, elaſtic, and therefore compreſſible. As ſoon as the bodies come into ſenſible contact, compreſſion *muſt* begin; for we may ſuppoſe the bodies to be two balls, which will therefore touch only in one point. The mutual preſſure, which is neceſſary in order to produce the retardation of A, and the acceleration of B, is exerted only on the foremoſt particle of A, and the hindmoſt particle B; but no atom of matter can be put in motion, or have its motion any way changed, unleſs it be acted on by an adequate force. The force urging any individual particle, muſt be preciſely competent to the production of the very change of motion which obtains in that particle. Except the two particles which come into contact in the colliſion, all the other particles are immediately actuated by the forces which connect them with each other; and the force acting on any one is generally compounded of many forces which connect that particle with thoſe adjoining. Therefore, when A overtakes B, the foremoſt particle of A is immediately retarded—the particles behind it would move forward, if their mutual connection were diſſolved in that inſtant; but, this remaining, they only approach nearer to the foremoſt ſtriking particles, and thus make a compreſſion, which gives occaſion for the inherent elaſticity to exert itſelf, and, by its reaction, retard the following particles. Thus each ſtratum (ſo to conceive it), continuing in motion, makes a compreſſion, which occaſions the elaſticity to react, and, by reacting, to retard the ſtratum immediately behind it. This happens in ſucceſſion: the compreſſion and elaſtic reaction begin in the anterior ſtratum, and take place in ſucceſſion backward, and the whole body gets into a ſtate of compreſſion. Things happen in the ſame manner in B, but in the contrary direction, the foremoſt ſtrata being the laſt which are compreſſed. All this is done in an inſtant (as we commonly, but inaccurately ſpeak), that is, in a very ſmall and inſenſible moment of time; but in this moment there is the ſame gradual compreſſion, increaſe of mutual action, greateſt compreſſion, common velocity, ſubſequent reſtitution, and final ſeparation, as in the caſe of bodies with a ſlender ſpring interpoſed, or even in the caſe of the mutually repelling magnets. In all the caſes, the changes of motion are produced by the elaſticity or the repulſion, and not by the transfuſion of the force of motion. The changing force is indeed inherent in the bodies, but not becauſe they are in motion; the uſe of the motion is to give occaſion, by continued compreſſion, for the continued operation of the inherent elaſticity. The whole proceſs may be very diſtinctly viewed, by making uſe of bodies of ſmall firmneſs, ſuch as foot-balls, or blown bladders. If blown bladders are uſed, each loaded with ſand, or ſomething that will require more force, and conſequently more compreſſion to impel it forward; we ſhall obſerve the compreſſion of both to be very conſiderable, and that a very ſenſible time elapſes during the proceſs of colliſion. This may even be obſerved very diſtinctly in a foot-ball, which is always ſeen to reſt a little on the toe before it flies off by the ſtroke. When one foot-ball is ſtrongly driven againſt another, they plainly adhere together for ſome time, and then the ſtricken ball flies off.

45
Internal proceſs of change through the ſubſtance of each body.

If we return to the example of the two balls with the ſpring interpoſed, we may make ſome farther uſeful obſervations. When the ſpring is in its ſtate of greateſt compreſſion, and the balls are moving with a common velocity, we can ſuppoſe that the ſpring is arreſted in that ſituation by a catch. It is evident that the two bodies will now proceed in contact with this velocity, which we have ſhewn to be $= \frac{\text{A}a \pm \text{B}b}{\text{A} + \text{B}}$.

46
Nature of imperfect elaſticity.

Now, in the conſtitution of ſuch maſſes of tangible matter as we have the opportunity of ſubjecting to our experiments, we find a ſtate of aggregation which very much reſembles this. Some bodies are almoſt perfectly elaſtic, that is, when their ſhape is changed by external preſſure; and that preſſure is removed, they recover their former ſhape completely, and they recover it with great promptitude. Glaſs, ivory, hard ſteel, are of this kind. But moſt bodies either do not recover it completely, or they recover it very ſlowly—ſome hardly recover it at all. A rod of iron will, when conſiderably bent, not nearly recover its ſhape; a rod of lead ſtill leſs; and a rod of ſoft clay will hardly recover it in any degree. Theſe, however, are but gradations of one and the ſame quality: if the quieſcent form of a body is very little diſturbed, it will recover it again. Thus, a common ſoft iron wire of N° 6. and 12 inches long, if twiſted once round, will return completely to its original form, and will allow this to be repeated for ever; but if it be twiſted $1\frac{1}{2}$ turns, it will untwiſt only 1: and in this new form it will twiſt and untwiſt one turn as often as we pleaſe. Even a rod of ſoft clay $\frac{1}{10}$th of an inch in diameter, and 7 feet long, will bear one twiſt as often as we pleaſe: but if twiſted 4 times, will untwiſt itſelf only one turn, and will do this as often as we chooſe. In ſhort, it appears that the particles of bodies, uſually called unelaſtic, will admit a ſmall change of diſtance or ſituation, and will recover it again, exhibiting perfect elaſticity, in oppoſition to very ſmall forces; but if they are forced too far from this ſituation, they have no tendency to return to it completely, but find intermediate ſituations, in which they have the very ſame connections with the ſurrounding particles; and in this new ſituation they can again exhibit the ſame perfect elaſticity, in oppoſition to very ſmall forces. Mr Coulomb conceives ſuch bodies to conſiſt of elaſtic particles: they manifeſt perfect elaſticity, ſo long as the forces employed to change their ſhape do not remove the particles from their preſent contacts; but if they are removed from theſe, they ſlide on to other ſituations, where they again exhibit the ſame appearances. To underſtand this fully, the reader may conſult the article Boscovich of this *Supplement*—The fact is ſufficient for our preſent purpoſe. Now, in this variable conſtitution, where the particles may take a thouſand different ſituations, and ſtill cohere, it is plain, that when a body has been dimpled by compreſſion, the particles have nothing to bring them back to their firſt ſituation when the compreſſing force is removed: the utmoſt elaſticity to be expected, is that which will not extend to one ſhift of ſituation; therefore, the reſtitution is altogether inſenſible. This is the caſe with all ſoft bodies, ſuch as clay—the ſame quality is manifeſted in all ductile bodies, ſuch as lead, ſoft iron and ſteel, ſoft copper, ſoft gold.

47
Effect of this colliſion.

Now let one of theſe bodies ſtrike another. The compreſſion, or the ſliding of the particles over each other, requires force, or mutual preſſure—This being accompanied by a reaction perfectly equal, muſt operate, during the compreſſion, preciſely as the equal repulſive forces did. It will take as much momentum from A as it gives to B; ſo that $\mathrm{A}\,a \pm \mathrm{B}\,b$ will remain invariably the ſame, and a common velocity will at laſt obtain, $= \frac{\mathrm{A}\,a \pm \mathrm{B}\,b}{\mathrm{A} + \mathrm{B}}$. The compreſſion can proceed no farther, and the two bodies muſt now proceed in contact with this velocity.

And thus we ſee, that in the caſe of compreſſible, but unelaſtic bodies, the changes of motion are produced by the coheſive forces inherent in the bodies; but not inherent in them becauſe they are in motion. We ſee clearly in this way, how the pendulum uſed by Robins and his followers gave a true meaſure of the velocity of the ball. All the while that it was penetrating into the pendulum, overcoming the coheſion as it went in, this coheſion was acting equally in both directions. While the fibre was breaking, it was pulling both ways; it was holding back the ball which was breaking it, and it was pulling forward the parts to which it ſtill adhered; and when it broke at laſt, it had produced equal effects on the ball and on the pendulum in oppoſite directions. By ſuch a proceſs, the pendulum was gradually accelerated, and acquired its utmoſt velocity when the ball had ceaſed to penetrate: Therefore, this velocity muſt be $= \frac{\mathrm{A}\,a}{\mathrm{A} + \mathrm{pend}^{\mathrm{m}}}$.

What ſhould we now expect to happen in the colliſion of bodies? Such bodies as exhibit perfect elaſticity, when examined by bending, or other fit trials, ſhould have their motions changed preciſely like the magnets, or bodies which repel or avoid each other at ſenſible diſtances. Bodies which exhibit no elaſticity whatever, ſhould continue in contact after colliſion. The common velocity in theſe ſhould be $\frac{\mathrm{A}\,a \pm \mathrm{B}\,b}{\mathrm{A} + \mathrm{B}}$. The perfectly elaſtic bodies ſhould ſuſtain changes of motion which are preciſely double of the changes ſuſtained by unelaſtic bodies, and ſhould ſeparate after colliſion with a relative velocity of receſs or ſeparation, preciſely equal to their relative velocity of mutual approach. And bodies poſſeſſing imperfect elaſticity, ſhould ſuſtain changes of motion, which differ from the changes on unelaſtic bodies, preciſely in proportion to the degree of elaſticity which they are *known* to poſſeſs. And, laſtly, if the changes of motion which obtain in the colliſion of bodies, are preciſely thoſe which would reſult from the operation of thoſe inherent forces of elaſticity and coheſion, NO OTHER FORCE WHATEVER CONCURS IN THEIR PRODUCTION: For we know that thoſe forces *do operate* in the colliſion; we ſee the compreſſion and reſtitution which are their effective cauſes, and their immediate effects. If any other force were ſuperadded, we ſhould ſee its effects alſo, and the motions would be different from what they are.

Now the fact is, that *we have never ſeen a body that is not, in ſome degree, compreſſible.* It has not pleaſed the Almighty Creator to make any ſuch here below. Aſſuredly He has not found ſuch to be of uſe for the purpoſes He had in view in this our ſublunary world. We know of no body that is perfectly unchangeable in its ſhape and dimenſions. It is therefore no loſs whatever to us, although we ſhould not be able to ſay *à priori* what their motions will be in colliſion. We cannot even fairly gueſs them, by reaſoning from what we obſerve in other bodies: For it is juſt as likely that their motions may reſemble thoſe of perfectly elaſtic bodies as thoſe of unelaſtic bodies; for we find that bodies of the moſt extreme hardneſs are generally highly elaſtic. Diamond, cryſtal, agate, quartz, and ſuch like, are the moſt elaſtic bodies we know. Philoſophers, however, rather think that the motions of perfectly hard bodies will reſemble thoſe of unelaſtic bodies; becauſe elaſticity ſuppoſes compreſſion. We do not pretend to ſay with confidence, what would be the motion of a ſingle atom of matter (which cannot admit of compreſſion) which is hit by another in motion. We ſee all the particles of terreſtrial matter connected with each other by certain modifications of the general force of coheſion, ſo as to produce various forms of aggregation; ſuch as aërial fluidity, liquid fluidity, rigidity, ſoftneſs, ductility, firmneſs or hardneſs; all of which are combined with more or leſs elaſticity. Theſe tangible forms reſult from certain poſitive properties of the material atoms of which the particles are compoſed; and, in all the caſes which come under our obſervations, theſe properties produce preſſures of one kind or another; all of which are moving forces. They are inherent in the particles and atoms: therefore when ſuch atoms are in motion, theſe forces are in a condition which affords occaſion for a *continuation* of this preſſure that is competent to the production of motion in another particle. But what would be the event of the meeting of atoms diveſted of ſuch forces, we profeſs not to know, or even to conceive.

The fact alſo is, that all the changes of motion, commonly called impulſions, *which have been obſerved*, are preciſely

48 The obſerved effects of colliſion are perfectly conformable to the propoſitions now eſtabliſhed.

preciſely ſuch as have been deſcribed. Unelaſtic bodies proceed in contact with the velocity $\frac{Aa \pm Bb}{A + B}$. Perfectly elaſtic bodies ſeparate after colliſion, and each ſuſtains double of the change that is ſuſtained by an unelaſtic body. Bodies of imperfect elaſticity differ from the two ſimple caſes, preciſely in the proportion of the elaſticity diſcoverable by other trials. The mutual actions are obſerved to be in the proportion of their relative motions, whatever the real motions may be. For not only are the changes of progreſſive motion exactly in this proportion, but the compreſſions and changes of figure, which we conſider as the immediate occaſions of thoſe actions, are alſo obſerved to be in the ſame proportions, *in all caſes that we can obſerve and meaſure with accuracy*. All theſe things can be aſcertained with great preciſion by means of the colliſion of pendulous bodies in the way pointed out by Sir Chriſtopher Wren (a method attributed by the French to their countryman Mariotte, but really invented by Wren, and exhibited to the Royal Society of London the week after he communicated his theory of impulſion).

49 Extenſive proof of the univerſality of equal action and reaction.

We muſt alſo infer from theſe facts, that the actions of bodies on each other are mutual, equal, and oppoſite. This is really an inference from the phenomena, and not an original or firſt principle of reaſoning. The contrary is conceivable, and therefore not abſurd. In the ſame way that we can conceive a magnet repelling iron, without imagining that the iron repels the magnet, we may conceive a golden ball capable of impelling a leaden ball before it, without conceiving that the leaden ball will impell the golden ball. We do not find this eaſy indeed; becauſe the contrary is ſo familiar, that the one idea inſtantly brings the other along with it. We apprehend it to be impoſſible to demonſtrate, that a leaden ball will not ſtop as ſoon as it hits the golden ball, or *vice verſa*. But all our experience ſhews us, that the preſſures exerted in contact are mutual, equal, and oppoſite. The ſame thing is obſerved in the forces which connect the parts of bodies. A quantity of ſand or water balanced in a ſcale will remain in equilibrio in whatever way it is ſtirred about; its parts always exert the ſame preſſure on the ſcale: ſo does a body ſuſpended by a ſtring or reſting on the ſcale, by whatever points it is ſupported. This could not be if the particles did not exert mutual and equal forces; nor could the phenomena called impulſions be what they are, if the preſſures occaſioned between the particles by the compreſſions and dilatations were not mutual and equal. This law of action and reaction muſt be admitted as univerſal, though contingent, like gravity. Doubtleſs it reſults from the properties which it has pleaſed the great Artiſt to give to the matter of which He has formed this world. There is one way in which we can conceive, moſt diſtinctly, how this may be a univerſal property of matter. If we grant the reality of attractions and repulſions *e diſtanti*, and ſuppoſe that every primary atom of matter is preciſely ſimilar to every other atom in all its properties, and that this aſſemblage of properties conſtitutes it a material atom; it follows, that every atom exerts the ſame attractions and repulſions, or has the ſame uniting and evaſive tendencies, and then the law of action and equal reaction follows of courſe. This is ſurely the very notion that any perſon is diſpoſed to entertain of the matter. And if mechanical force and mobility are the qualities which diſtinguiſh what is material from mind or other immaterial ſubſtances, the law of equal and contrary reaction ſeems nearly allied to the claſs of firſt principles.

Of all the phenomena that indicate this perfect equality of action and reaction, the moſt ſuſceptible of accurate examination is the ſameneſs or equality of action when the relative motions are equal. Now there is no phenomenon more certain than this. In conſequence of the rotation of the earth round its axis, and its revolution round the ſun, it is plain that all our experiments and obſervations are on relative motions only. Now, we not only find that the actions of two bodies ſubjected to experiment are equal when the relative motions are equal, but we find that all our meaſures of action on a ſingle body are proportional to the apparent motions which they produce. It requires preciſely the ſame force to impel a ball eaſtward, weſtward, ſouth, or north, at 12, or 3, or 6, or 9 o'clock: yet the real motions are immenſely different in all theſe caſes, and it is only the relative motions that have the proportions which we obſerve. Another very important point deducible from our experiments is, that the ſame *preſſure* produces the ſame change of motion, whatever may be the velocity. We know this by obſerving, that when the mutual dimpling or compreſſion is the ſame, the change of motion is the ſame, whatever be the hour of the day. This could not be if it required a greater preſſure to change the velocity 100000 into 100001, than to change the velocity 1 into the velocity 2. Yet this is one of Leibnitz's great metaphyſical arguments for proving that the force accumulated, and now inherent, in a moving body, is proportional to the ſquare of its velocity. We beg that this may be kept in remembrance.

It muſt be granted, that what we have already ſaid on the ſubject of impulſion may be called an *explanation*; for it deduces the phenomena from general and unqueſtionable principles, and from acknowledged laws of Nature. The only principle uſed is, that a moving force is indicated, characteriſed, and meaſured, by the motion which it produces. It is an acknowledged law of Nature, that preſſures are moving forces; alſo, that moving forces appear in caſes where we obſerve neither preſſures nor impulſions, and which we call repulſions or evaſive tendencies; that theſe are mutual and equal: and we have ſhewn, how a certain ſet of changes of motion reſult from them, and have ſtated diſtinctly the whole proceſs: we ſhewed, that theſe phenomena are ſimilar to thoſe of common impulſion; and we then ſhewed in what manner the motion of a body *gives occaſion* to the exertion of various moving forces, called *elaſticity*, *coheſion*, &c. and that this exertion muſt produce motions ſimilar to thoſe produced by repulſions *e diſtanti*; and, laſtly, we inferred, from the perfect ſameneſs of thoſe reſults with the actual phenomena of impulſion, that thoſe corpuſcular forces are the immediate and *only* cauſes of the changes called impulſions, and commonly aſcribed to a *peculiar* force inherent in a moving body.

50 Why does the philoſopher *attempt* to explain gravitation, &c. by impulſion?

From a collective view of the whole, we think it clear, that the opinion that impulſion is the ſole cauſe of motion is unwarranted. We ſee that the phenomena of impulſion are brought about by the *immediate* operation of preſſure; and we ſee numberleſs inſtances of preſſure, in which we cannot find the ſmalleſt trace of impulſion. It is therefore a moſt violent and unwarranted opinion, which aſcribes to repeated unperceived impulſions all thoſe ſolicitations to motion by which, or in conſequence of which, the motions of bodies are affected by diſtant bodies, or bear an evident relation to the ſituation and diſtance of other bodies; as in the examples of planetary deflection, terreſtrial gravitation, magnetical and electrical deflexions, and the like. There is nothing in the phenomenon of the preſſure of gravity that ſeems to make impulſion more neceſſary or more probable than in the preſſure of elaſticity, whether that of a ſpring or of an expanſive fluid. The admiſſion of an unperceived fluid to effect thoſe impulſions is quite unwarranted, and the explanation is therefore unphiloſophical, even although we ſhould perceive intuitively that an atom in motion will put another into motion by hitting it. We apprehend that this cannot be affirmed with any clear perception of its truth.

51 Impulſion is ſuppoſed to be better underſtood and more familiar.

On the whole, therefore, we muſt aſcribe that contented acquieſcence in the explanations of gravitation, and other attractions and repulſions, by means of impulſe (if the acquieſcence be not pretended), to the frequency and familiarity of impulſion, and perhaps to the perſonal ſhare and intereſt we have in this mode of producing motion. We know that it is always objected that nothing is explained, when we ſay that A repels B, or that B avoids A; but we muſt ſay in return, that nothing is explained, when we ſay that A impels B by hitting it, or that B flies away from the ſtroke. Why ſhould it not be allowed to uſe the term repelling power, when it is allowed to uſe the term impelling power, the force of impulſe, inertia? All theſe terms only expreſs phenomena. Does the word body expreſs any more?

52 It is not better underſtood.

The maxim, that a body cannot act *where* it is not, any more than *when* it is not, is a quaint and lively expreſſion, and therefore has conſiderable effect: It may be granted; for we apprehend that we underſtand ſo little about *when* and *where*, that we cannot demonſtrate the affirmative or negative in either caſe, and that they are on a par with reſpect to our knowledge of them. We can have no doubt, however, of the fact, that our mind can be affected by an external object that is merely recollected. And we apprehend, that we know nothing of the difference between body and mind but what we have learned by experience. Body, for any thing that we aſſuredly know to the contrary, may affect, or be affected by, a diſtant body, as well as mind may be. It is therefore worth while to pay ſome farther attention to the phenomena, in order to ſee whether this experience is ſo univerſal and unexcepted as is believed. As Mr Cotes, and many of Newton's diſciples, are accuſed of explaining many phenomena by attraction and repulſion which their opponents affirm to be caſes of impulſion; it is not impoſſible but that ordinary obſervers, who have no preconceived theories, may imagine impulſions to obtain in caſes where a more accurate inſpection would convince them that no impulſion has happened.

53 Enquiry into the familiarity of impulſion. Inſtances of a foot-ball.

When we kick away a foot-ball, we conſider it as a ſort of ſolid continuous body; yet we know that it muſt be filled with compreſſed air. It may not be impoſſible to have it of its round ſhape without being ſo filled: but we know that, in this condition, it would not fly away from our foot by the ſtroke; we ſhould only force in the ſide which we kick, and the flaccid ſkin would lie at our feet. But when it is filled with ſtrongly compreſſed air, we can form to ourſelves a pretty diſtinct notion how it is made to move off. Our foot preſſes on a part of the ſkin: this compreſſes the air againſt the anterior part of the bag, and forces it away. If we reflect more ſeriouſly on the proceſs, we can ſtill conceive it clearly enough, by thinking on a row of aereal particles, reaching from the part ſtruck by the foot to the anterior part, each touching the other, and therefore forcing the anterior part forward. The air is conceived to conſiſt of a number of little ſpherules in contact, each of which is compreſſible; and we think the operation illuſtrated by ſuppoſing each to be like a little veſicle or bladder. This we believe to be the uſual way of conceiving the conſtitution of expanſive fluids: But this will not agree at all with the known properties of air; for it can be ſtrictly demonſtrated, that if ſuch a collection of elaſtic veſicles be compreſſed into the half of their ordinary bulk, every veſicle will be changed from a ſphere into a perfect cube, touching the adjoining cubes in every point of its ſix ſides, and ſtrongly preſſed againſt them. It can alſo be demonſtrated, that if a leaden cube of one inch be included in the box, and placed with its ſides parallel to the ſides of the box, and the compreſſion be then made, all the little cubic veſicles will acquire the ſame poſition. If the box be now turned upſide-down, it can be demonſtrated that the weight of this leaden cube will not be ſufficient for overcoming the reſiſtance of the compreſſed cubes. This compreſſed maſs will not be fluid, but will require a very conſiderable force to preſs the leaden cube through it, juſt as we find ſuch a force neceſſary for moving a body through melted glaſs: the particles no longer ſlide on each other like uncompreſſed ſpherules; each will require about half of the compreſſing force, in order to overcome the friction, or obſtruction like friction, produced in ſliding along the ſurface of the contiguous cubes. But we know that air remains perfectly fluid, although vaſtly more compreſſed than this. This, therefore, cannot be like the conſtitution or form of air. Moreover, it is well known that air has been made ten times denſer than its ordinary ſtate, and is then perfectly fluid. It has alſo been made a hundred times rarer, and it ſtill remains perfectly fluid. In this ſtate its particles muſt be ten times farther removed from each other than in the former ſtate, of a thouſand times greater denſity. Yet we know that this rare air is compreſſed with a force equal to the weight of a ſtratum of mercury $\frac{1}{3}$d of an inch in thickneſs, and that if $\frac{1}{3}$d of this preſſure be removed, it will expand till it is 150 times rarer than common air; that is, there is ſome force which puſhes the particles ſtill farther from each other. This force evidently extends beyond the tenth particle of air that is made ten times denſer than common air. Therefore the elaſticity of air does not ariſe from the contact of particles, which are elaſtic like blown up bladders, but from ſome force which extends beyond the adjoining particles. There is no greater reaſon, therefore, for ſuppoſing, that the particles of air touch each other, than for ſuppoſing that the two magnets touch each other becauſe they repel. A row of magnets floating on quickſilver, and placed with their ſimilar poles fronting

ing each other, and very near, will tend to ſeparate, and they require to be held in by a ſtop put at each end of the canal; and if one ſtop be gradually withdrawn, the magnets will all ſeparate, and exhibit the general mechanical effects of a row of aereal particles ſeparating by the removal of preſſure. There ſeems, therefore, to be the ſame neceſſity for the operation of an intervening impelling fluid for producing this ſeparation or elaſticity of the aereal maſs, as for ſeparating the magnets.

Is very doubtful.

The reſult of theſe remarks ſeems to be, that the impulſion of a foot-ball is not brought about in the way that is commonly imagined, by the excitement of corporeal preſſure at the points of contact of the two foot-balls. For we ſee it almoſt demonſtrated, that the progreſſive motion of the anterior part of one of the balls has been produced without contact, or, at leaſt, by the *intervention* of repulſions acting at a diſtance.—May not this obtain, even in the points in which we ſuppoſe the two balls actually to touch, in the act of impulſion?

54
Many caſes of doubtful contact.

But farther—Every perſon has obſerved the brilliant dew drops lying on the leaves of plants. Every perſon acquainted with Newton's optical diſcoveries, muſt be convinced that the dew-drop is not in mathematical contact with the leaf; if it were, it could have no brilliancy. Moſt perſons have obſerved the rain drops of a ſummer ſhower fall on the ſurface of water, and roll about for a few ſeconds, exhibiting the greateſt brilliancy. They cannot, therefore, be in mathematical contact with the water. There muſt be a ſmall diſtance between them, and therefore ſome force which keeps them aſunder, and carries the weight, that is, counteracts the downward preſſure of the rain drop. We know that ſome inſects with long legs can run about on the ſurface of water; and if we lift them carefully, and ſet them on glaſs, their feet do not wet it. Put a little ſpirit of wine into this water, and make it lukewarm, and the inſect inſtantly ſinks up to the belly, and cannot move about as before: Its feet will now wet a glaſs. A well-poliſhed ſteel needle, even of conſiderable ſize, if perfectly clean and dry, will float on water without being wetted: It is obſerved to make a conſiderable depreſſion on the ſurface of the water, juſt as a heavy bar of iron would make when laid on a feather bed—the needle diſplaces a quantity of water equal to itſelf in weight, yet does not touch it, for it is not wetted. If it be previouſly wetted, it will not diſplace any water, and will not float. There is ſomething, therefore, which keeps the water at a diſtance from the feet of the inſect, and from the needle, exerting a certain upward preſſure on them. The preſſure and the reaction are indeed very ſmall; but they would produce a very ſenſible motion if continued ſufficiently long in proper circumſtances. Here would be a production of motion, which moſt perſons would call an impulſion—yet there would be no ſtroke, no contact, and therefore no true impulſion.

55
Very remarkable caſe of convex lenſes fairly ſeeming to touch.

We now beg the reader to attend minutely to Newton's famous experiment with the object glaſſes of long teleſcopes, which we have mentioned circumſtantially in the article OPTICS, *Encycl.* n° 63—68.

When the upper glaſs is very thin and light, no colour appears at the point of contact: but by preſſing it down with ſufficient force, we ſhall have a black or unreflecting ſpot in the middle, ſurrounded by a ſilvery ring, and then by a ſeries of rings of various colours, according to the diſtance between the parts of the glaſſes where the colours appear. Newton has counted 50 of theſe rings. He ſhews, by a careful computation from the known figure of the glaſſes, that the differences between the diſtances which exhibit theſe colours are all preciſely equal, and that each is about $\frac{1}{89000}$ of an inch. Therefore, ſuppoſing that the glaſſes are in mathematical contact where the unreflecting ſpot appears, making one continuous maſs of glaſs, their diſtance at the outermoſt ring muſt not be leſs than $\frac{50}{90000}$ of an inch, or $\frac{1}{180}$ of an inch. Therefore, when one glaſs carries the other, without any appearance of colour at the middle, we muſt conclude that there is a repulſion exerted between the neareſt parts, at a diſtance not leſs than $\frac{1}{180}$ of an inch, ſufficient for ſupporting the upper glaſs. It requires an increaſe of preſſure to produce the firſt appearance of colour; and when the preſſure is ſtill more increaſed, new colours appear in the middle, and the colour formerly there is now ſeen in a ſurrounding ring; theſe multiply continually, by new ones ſpreading from a central ſpot. A great preſſure at laſt produces the unreflecting ſpot in the centre, which, unlike to all the coloured ſpots which had emerged in ſucceſſion, is ſharply defined, and never round, but ragged, and it is immediately ſurrounded by a bright ſilvery reflection. The ſhape of this ſpot depends on the figure of the ſurfaces; for, on turning the upper lens a little round its axis, the inequalities of the edge of the ſpot turn, in ſome degree, with it. This ſeemingly trifling remark will be found important by the mechanician: A ſtill farther increaſe of preſſure enlarges the unreflecting ſpot, and the dimenſions of all the rings—When the preſſure is gradually withdrawn, the rings ſhrink in their dimenſions, the unreflecting ſpot diſappears firſt, and each ring in ſucceſſion contracts into a ſpot, and vaniſhes. Here we have, by the way, an explanation of the brilliancy of dew-drops: they come ſo near, perhaps, that the neareſt point reflects the ſilvery appearance—but they do not touch; the inſtant that they touch a wetted part, making one maſs of tranſparent matter, all brilliancy is gone.

56
They repel each other;

Here then are inconteſtible proofs of a force, be its origin what it may, which keeps the glaſſes aſunder, and even cauſes them to ſeparate; which manifeſts itſelf by withſtanding preſſure; and therefore is, itſelf, a preſſure, or equivalent to a preſſure—It varies in its intenſity by a change of diſtance; but we have not been able to aſcertain by what law. It muſt not be meaſured by the ſimple variation of the external preſſure; for ſince we ſee that, even before any colour appears in the centre, the weight of the upper lens is ſupported, we muſt conclude that the glaſſes are exerting at leaſt an equal force all around the circumference of the outermoſt ring. It is evident, that the computation of the whole force, exerted over all the coloured ſurface, muſt be difficult, even on the ſimpleſt hypotheſis concerning the law of repulſion: we can only ſay that it increaſes by a diminution of diſtance. It is very eaſy to compute the increaſe of external preſſure, which would ſuffice if the repelling force were equal at all diſtances; or if it varied according to any ſingle power of the diſtances. We have tried the inverſe ſimple, duplicate, and triplicate ratio; but the fact deviated widely from them all. The repulſion does not change nearly ſo much as in the ſimple inverſe ratio of the diſtances, if the glaſſes be ſuppoſed to touch in the whole ſurface of the unreflecting ſpot. But we found, that if we ſuppoſe them ſeparated, though at a diſtance equal to forty times the difference of diſtance at which the colours change, that is, $\frac{1}{222}$ of an inch, the preſſures employed in the experiment accord pretty well with a repulſion inverſely as the diſtance, but ſtill with a very conſiderable deviation in the great preſſures. In the courſe of a number of experiments with a favourite pair of lenſes, we broke the uppermoſt by too ſtrong a preſſure. We then cut out of it, with a lapidary's hollow drill, a piece of $\frac{1}{4}$ of an inch in diameter, and perfectly round, and we ſqueezed it on the other by a meaſured preſſure, till we produced a colourleſs ſpot of nearly $\frac{1}{6}$th of an inch in diameter, with a ſilvery margin. Computing from this, we thought ourſelves warranted to ſay, that not leſs than 800 pounds are neceſſary for producing a black ſpot of one inch ſquare!

57 And may impel without touching.

Now, what is the conſequence of all this in the doctrine of impulſion? Surely this:—If a lump of this glaſs ſtrike another lump, and put it in motion, and if the mutual preſſure in the act of colliſion do not exceed 700 pounds on the ſquare inch, the motion has been produced without mathematical contact, and the production can no more be called impulſe than the motion of the magnet in our firſt experiment. The changes of motion have been the operation of moving forces, ſimilar to the force of magnetiſm; and if a ſtream of truly impelling fluid be neceſſary for producing the motion of the magnet, it is equally neceſſary for producing the motion of the piece of glaſs.

It may be ſaid here, that we cannot compare impulſe and preſſure. A ſlight blow will ſplit a diamond which could ſupport a houſe. A ſlight blow may therefore be enough for exciting all the preſſure neceſſary for producing mathematical contact. We muſt here appeal to what every man feels on this occaſion. We doubt exceedingly whether any perſon will think that, when one piece of glaſs gives another a gentle blow, and puts it into motion, with the velocity of a few inches per ſecond, a blow which he diſtinctly hears, there has been exerted a preſſure at all approaching to 800 pounds per ſquare inch.—We have ſuſpended a pair of lenſes, by an apparatus ſo ſteady and firm, that they could touch only at the centres of each ſurface; and, having placed ourſelves properly, we could ſee, with ſufficient diſtinctneſs, the momentary appearance of the coloured ſpot at the inſtant of colliſion. We ſaw this, with the fulleſt confidence that it was of no conſiderable breadth in a moderate ſtroke, and that it was very ſenſibly broader when the ſtroke was more violent. We did not truſt our own eye alone, but ſhewed it to perſons ignorant of philoſophy, and even to children, often without telling them what to look for, but aſking them what they ſaw. From all the information that we could gather, none of the preſſures came near to what muſt have been neceſſary for producing the black ſpot. This could not be miſtaken: for although the outer rings are but faint, there are five or ſix near the centre which are abundantly vivid for affecting the eye by the momentary flaſh. Beſides, the dimenſions of the lenſes, and the weight of the metal cells in which they were fixed, were ſuch as muſt have cauſed them to ſplit before the black ſpot could be produced in the centre.

And certainly do ſo, even in violent ſtrokes.

Theſe things being maturely conſidered, we imagine that few perſons will now doubt the juſtice of our aſſertion, that in all theſe examples, the motions have been produced without mathematical (or rather geometrical) contact.—And we imagine alſo, that few will refuſe granting that this is not peculiar to glaſs, but obtains alſo in the colliſion of other bodies. We have not thought of any method for putting this beyond doubt; but we have better reaſons than mere likelihood for being of this opinion. Every one acquainted with the Newtonian diſcoveries in optics, knows that this curious appearance of the coloured rings is the conſequence of the action of tranſparent bodies on the rays of light, by which theſe are bent aſide from their rectilineal courſe, and that this deflection takes place at a diſtance from the diaphanous body; a diſtance which the ſagacity of the great philoſopher has enabled us to meaſure. Now, it is known that metals and other opake bodies produce the very ſame deflections of the rays, bending them toward themſelves at one diſtance, and from them at other diſtances; in ſhort, attracting or repelling them as the diſtance varies. Nothing but prepoſſeſſion can hinder a perſon from aſcribing ſimilar effects to ſimilar cauſes; and, therefore, thinking it almoſt certain, that this mutual repulſion is not peculiar to glaſs, but common to all ſolid bodies.

To all this we may ſurely add the celebrated experiment of Mr Huyghens; in which it is evident, that a ſmooth plate of metal attracts another, even although there be a ſilk fibre interpoſed between them. (See Phil. Tranſ. n° 86). Is it not highly probable, that at a ſmaller diſtance the bodies repel each other? For we obſerve, that metals, as well as tranſparent bodies, attract the rays at one diſtance and repel them at another.

58 Impulſion is not ſo familiar as is believed.

Surely our readers will now grant, that the production of motion by impulſion, as diſtinguiſhed from the production by action *e diſtanti*, is not ſo familiar a phenomenon as was imagined, and that it may even be ſaid to be rare in compariſon: for the inſtances of moderate impulſes are numberleſs. The claim of this mode of explaining difficult phenomena by impulſion, has therefore loſt much of its force: and we ſee much leſs reaſon for calling in the aid of inviſible fluids, in order to *explain* the action of gravity, magnetiſm, and electricity.

59 Still greater doubts. Obſervations on a ſoap bubble.

But we have ſtill more important information from the optical diſcovery of Newton. Let the reader turn again to Optics, *Encycl.* n° 65, and read the account of the phenomena exhibited by the ſoap-bubble. The bubble is thinner and thinner as we approach the very uppermoſt point of it. It alſo exhibits luminous rings, which vary in their colour, in the ſame order as in the ſpace between the lenſes. Theſe rings come to view in the ſame manner. Firſt, a coloured ſpot appears in the ſummit of the bubble; this becomes a ring, and is ſucceeded by another ſpot, as the bubble grows thinner in that part, by the gradual ſubſiding of the watery film. At laſt a black ſpot appears at top, well defined, but of irregular ſhape, ſurrounded by a ſilvery ring. This ſpot, when viewed very narrowly, is obſerved to reflect a very minute portion of light, with out *ſeparating* the differently colorific rays of which it conſiſts; but it *contains* them all, as may be proved by viewing it through a priſm. After ſome little time, the bubble burſts.

Surely we muſt infer from this, that there is a certain thickneſs of the tranſparent plate which renders it unfit for the vivid reflection of light. Does it not legitimately follow from this, that the unreflecting ſpot between the lenſes ceaſes to entitle us to ſay, that they are in contact in that place? All that we can conclude from its appearance is, that the diſtance ſtill between the glaſſes is too ſmall to fit the place for the vivid reflexion of light. This concluſion is indiſputable. Were it refuſed, we are furniſhed with an inconteſtible proof by the ſame bountiful hand. Newton aſcribed the colours to the reflection of the plate of air between the glaſſes, and expected the ceſſation of them when the air is removed. His friend Mr Boyle had lately invented a commodious air pump. The trial was made, and young Newton found himſelf miſtaken; for the colours ſtill appeared, and he even thought them more brilliant. He then tried the effect of water, expecting that this would diminiſh their luſtre. So it did; and he found that the dimenſions of the rings were diminiſhed in the proportion of 4 to 3; namely, the proportion of the refractions of glaſs and water. By this time Newton had diſcovered the curious mechanical relation between bodies and the rays of light; and his mind was wholly abſorbed by the diſcovery, and by the revolution he was about to make in the mathematical doctrines of optics. Unfortunately for us, he did not, at that time, attend to the mighty influence which the diſcovery would have on the whole of mechanical philoſophy, and therefore occupied himſelf only with ſuch phenomena as ſuited his preſent purpoſe. A moſt important phenomenon paſſed unnoticed. In repeating Sir Iſaac Newton's experiments, we found that the diameters of the rings decreaſed in the proportion of 4 to 3 only in certain circumſtances. When the upper lenſe was preſſed on the other by a heavy metal ring, ſo as to produce three or four coloured rings, we found, that when water got between them, ſometimes no colours whatever appeared; ſometimes there was a ring or two, and the diameters were diminiſhed in a much greater proportion than Newton had aſſigned. Well aſſured of the extreme nicety of all his proceedings, we were much puzzled with this diſcrepancy, and mentioned it to a moſt reſpectable and intelligent friend, the late Dr Reid of the univerſity of Glaſgow, a mathematician and naturaliſt of the firſt rank. He thought it not improbable that the glaſſes ſeparated from each other, lifting up the weight, by attracting the water into the interſtice, in the ſame manner that we obſerve wood to ſwell with moiſture. We immediately got an apparatus which compreſſed the glaſſes by means of four ſcrews; and now we ſaw Newton's proportion moſt ſtrictly obſerved. But in proſecuting the experiment, we found that the introduction of the water *always* effaced a very ſmall ſpot. This happened after precautions had been taken to prevent all ſeparation of the glaſſes. As the proportion of 4 to 3 has a relation to refractive power, although we have not been able to deduce it as a neceſſary conſequence, we nevertheleſs conſidered it as a ſufficient proof, that the diſtance of the glaſſes *had not changed* by introducing the water between them. Therefore we think ourſelves well entitled to conclude, that the diſappearance of the black ſpot was not owing to a ſeparation of the glaſſes, which admits the water into the empty ſpace; and we affirm, that before the entry of the water, there was room for it in the place which reflected no light; that is, that although the glaſſes were preſſed together with a very great force, they were not in contact.

Remark. It deſerves remark, that in endeavouring to produce the black ſpot, when water is between the glaſſes, we found great and unaccountable anomalies. Sometimes a moderate increaſe of preſſure produced it, and ſometimes we were not able to produce it by any preſſure. Several lenſes were broken in the trial. We are led to think that the thickneſs which gives the ſilvery reflection is much greater than the 8900th part of an inch, and that it is not the ſame in all glaſſes. But we were interrupted in theſe experiments, and indeed in all active purſuits, by bad health, which has never permitted their renewal. The ſubject is of great importance to the curious mechanicians, and we earneſtly recommend it to their attention. There is ſomething very remarkable in the abrupt ceſſation of the coloured reflection. At a certain thickneſs *all* colours are reflected, without ſeparation, producing the whiteneſs of ſilver. The ſmalleſt diminution of it hinders the *vivid* reflection of *all* colours, and then there ſeems to ſucceed a thickneſs which equally reflects a ſmall proportion of *all* without ſeparation. The fineſt poliſh that can be given to glaſs in the tool of the artiſt, leaves irregularities which occaſion the irregular ragged figure of the ſpot. It is worth trying, whether ſmoothing the ſurfaces (both) by a ſoftening heat will remove this ruggedneſs. If it does, without deſtroying the ſharp termination, it will prove the abrupt paſſage from *eſſe* to *noneſſe*.

The laſt remark to be made on this important experiment in optics is, that the diſtance between the glaſſes which is unfit for vivid reflection, cannot be determined by means of the other meaſurable intervals. It may be equal to many of them taken together. The ſame muſt be granted with reſpect to the thickneſs of the black ſpot on the top of the ſoap bubble. We attempted to meaſure this thickneſs by letting a drop (of a known weight) of ſpirit of turpentine ſpread on the ſurface of water. As it ſlowly enlarged in ſurface, it decreaſed in thickneſs, and produced, in regular order, ſeveral of the more compounded colours of the Newtonian ſeries. But before it came to the 20th ring from the centre, it became very irregular and ſpotty.

60 Contact is not proved in colliſion.

The inference to be drawn from this combination of the two optical facts is remarkable and important. It is, that we have no authority for affirming that the changes of motion by the colliſion of bodies is brought about by abſolute contact in any inſtance whatever. The glaſſes are not in contact where there is vivid reflection; and we have no proof that they are in contact in the black ſpot, however great the compreſſion may be.

61 Therefore impulſion cannot explain gravitation;

It is hardly neceſſary now to ſay, that all attempts to explain gravitation, or magnetiſm, or electricity, or any ſuch apparent action at a diſtance by the impulſions of an unſeen fluid, are futile in the greateſt degree. Impulſion, by abſolute contact, is ſo far from being a familiar phenomenon, that it may juſtly be queſtioned whether we have ever obſerved a ſingle inſtance of it.

The ſuppoſition of an inviſible impelling fluid is not more gratuitous than it is uſeleſs; becauſe we have no proof that a particle of this fluid does or can come into contact with the body which we ſuppoſe impelled by it, and therefore it can give no explanation of an action that is apparently *e diſtanti*.

62 But impulſion may be explained by continued preſſure.

The general inference from the whole ſeems to be, that, inſtead of explaining preſſure by impulſe, we muſt not only derive all impulſe from preſſure, but muſt alſo aſcribe all preſſure to action from a diſtance; that is, to properties of matter by which its particles are moved without geometrical contact.

This collection of facts conſpires, with many appearances of fluid and ſolid bodies, to prove that even the particles of ſolid, or ſenſibly continuous bodies, are not in contact, but are held in their reſpective ſituations by the balance of forces which we are accuſtomed to call attractions and repulſions. The fluidity of water under very ſtrong compreſſions (which have been known to compreſs it $\frac{1}{26}$ of its bulk), is as inconſiſtent with the ſuppoſition of contact as the fluidity of air is. The ſhrinking of a body in all its dimenſions by cold, nay, even the bending of any body, cannot be conceived without allowing that *ſome* of its ultimate unalterable atoms change their diſtances from each other. The phenomena of capillary attraction are alſo inexplicable, without admitting that particles act on others at a diſtance from them. The formation of water into drops, the coaleſcence of oil under water into ſpherical drops, or into circular ſpots when on the ſurface, ſhew the ſame thing, and are inexplicable by mere adheſion. In ſhort, all the appearances and mutual actions of tangible matter concur in ſhewing, that the atoms of matter are endowed with inherent forces, which cauſe them to approach or to avoid each other. The opinion of Boſcovich ſeems to be well founded; namely, that at all ſenſible diſtances, the atoms of matter tend toward each other with forces inverſely as the ſquares of the diſtances, and that, in the neareſt approach, they avoid each other with *inſuperable* force; and, in the intermediate diſtances, they approach or avoid each other with forces varying and alternating by every change of diſtance. See the article Boscovich, *Suppl.*

63 Phyſical contact explained.

From all that has been ſaid, we learn that phyſical or ſenſible contact differs from geometrical contact, in the ſame manner as phyſical ſolidity differs from that of the mathematician. Euclid ſpeaks of cones and cylinders ſtanding on the ſame baſe, and between the ſame parallels. Theſe are not material ſolids, one of which would preſs the other out of its place. Phyſical contact is indicated, immediately and directly, by our ſenſe of touch; that is, by exciting a preſſure on our organ of touch when it is brought ſufficiently near. It is alſo indicated by impulſion; which is the immediate effect of the preſſure occaſioned by a ſufficient approximation of the body impelling to the body impelled. The impulſion is the completion of the ſame proceſs that we deſcribed in the example of the magnets; but the extent of ſpace and of time in which it is completed is ſo ſmall that it eſcapes our obſervation, and we imagine it to be by contact and in an inſtant. We now ſee that it is ſimilar to all other operations of accelerating or retarding forces, and that no change of velocity is inſtantaneous; but, as a body, in paſſing from one point of ſpace to another, paſſes through the intermediate ſpace; ſo, in changing from one velocity to another, it paſſes through all the intermediate degrees without the ſmalleſt *ſaltus*.

We thus avoid many abſurdities.

And, in this way, is the whole doctrine of impulſion brought within the pale of dynamics, without the admiſſion of any new principle of motion. It is merely the application of the general doctrines of dynamics to caſes where every accelerating or retarding force is oppoſed by another that is equal and contrary. We have found, that the opinion, that there is inherent in a moving body a peculiar force, by which it perſeveres in motion, and puts another in motion by ſhifting into it, is as uſeleſs as it is inconſiſtent with our notions of motion and of moving forces. The impelled body is moved by the inſuperable repulſion exerted by all atoms of matter when brought ſufficiently near. The retardation of the impelling body does not ariſe from an *inertia*, or reſiſting ſluggiſhneſs of the body impelled, but becauſe this body alſo repels any thing that is brought ſufficiently near to it. We can have no doubt of the exiſtence of ſuch cauſes of motion. Springs, expanſive fluids, cohering fibres, exhibit ſuch active powers, without our being able to give them any other origin than the fiat of the Almighty, or to comprehend, in any manner whatever, how they reſide in the material atom. But if once we admit their exiſtence and agency, every thing elſe is deduced in the moſt ſimple manner imaginable, without involving us in any thing incomprehenſible, or having any conſequence that is inconſiſtent with the appearances. Whereas both of theſe obſtructions to knowledge come in our way, when we ſuppoſe any thing analogous to force inherent in a moving body ſolely becauſe it is in motion. It forces us to uſe the unmeaning language of force and motion paſſing out of one body into another; and to ſpeak of force and velocity as things capable of diviſion and actual ſeparation into parts. The force of inertia is one of the bitter fruits of this miſconception of things. It is amuſing to ſee how metaphyſicians of eminence, ſuch as D'Alembert, endeavour to make its operations tally with acknowledged principles. In his celebrated work on dynamics, the moſt elaborate of all his performances, he explains how a body, whoſe maſs is 1, moving with the velocity 2, muſt ſtop another body whoſe maſs is 2, moving with the velocity 1, in the following manner: He ſuppoſes the velocity 2 to conſiſt of two parts, and that, in the inſtant of colliſion, one of theſe parts deſtroys the motion of one half of the other body, and then the other part deſtroys the motion of the other half. Theſe are words; but in vain ſhall we attempt to accompany them by clear conceptions. His diſtinction between the force of inertia and what he calls the active forces of bodies, ſuch as the force of bodies which ſtrike each other in oppoſite directions, is equally unſuſceptible of clear conceptions. Active forces (ſays he) abſorb a part of the motion; but when inertia takes part of the motion from the ſtriking body, this motion paſſes wholly into the body that is ſtricken, none of it being abſorbed or really deſtroyed. He demonſtrates this by the equation $A \times \overline{a-x} = B \times \overline{x-b}$, which is a mere narration of facts, but no deduction from the nature of inertia, nor even any eſtabliſhment of that nature by philoſophical argument. And in attempting to give ſtill clearer notions (being ſenſible that ſome great obſcurity ſtill hangs about it), he ſays, "Inertia therefore, and properly ſpeaking, is the mean of communicating motion from one body to another. Every body reſiſts motion; and it is by reſiſting that it receives it; and it receives preciſely as much as it deſtroys in the body which acts on it." Surely almoſt every word of this ſentence is doing violence to the common uſe of language. What can be more incomprehenſible than that a body reſiſts motion only when it receives it! Should a man be thought to reſiſt being puſhed out of his place when he actually allows another to diſplace him, and not to reſiſt when he firmly keeps his place? All theſe difficulties and puzzling queſtions vaniſh when we give over ſpeaking of inertia as ſomething diſtinguiſhable from the active forces or cauſes of motion which we find in bodies, and diſtinguiſh by the names of elaſticity, coheſion, magnetiſm, electricity, weight, &c. and which philoſophers have claſſed under one name, accelerating or retarding force, according as its direction chances to be the ſame, or the oppoſite to that of the motion under conſideration. To ſuppoſe it a *peculiar* faculty by which a body maintains its condition of motion or reſt, is contrary to every conception that we can annex to the words faculty, power, force. It is frivolous in the extreme to ſay, that ſnow has the faculty of continuing white or cold; or that it reſiſts being melted becauſe it melts, or becauſe heat muſt be employed to melt it.

64
Strongeſt argument for inertia is the compoſition of force with a previous motion.

The only argument that we know for giving the name force to the perſeverance of matter in its ſtate of motion (or rather for aſcribing this perſeverance to the exertion of a peculiar faculty), which appears to deſerve any attention, is one that we do not recollect the expreſs employment of for this purpoſe, namely, the compoſition of a previous motion with the motion which a known force would produce in the body at reſt. We know, that if a body be moving eaſtward at the rate of four feet per ſecond, and a force act on it which would impel it from a ſtate of reſt at the rate of three feet per ſecond to the ſouth, the body will move at the rate of five feet per ſecond in the direction E. 36° 52′ S. We know alſo, that if a force act on this body at reſt, ſo as to give it a motion eaſtward at the rate of four feet per ſecond, and if another force act on it at the ſame inſtant, ſo as to give it a motion to the ſouth at the rate of three feet per ſecond, the body will move at the rate of five feet per ſecond in the direction E. 36° 52′ S. In this inſtance, the body previouſly in motion ſeems to poſſeſs ſomething equivalent to what is allowed to be a moving force. Why therefore refuſe it the name? The anſwer is eaſy. The term force has been applied, by all parties, to whatever produces a *change* of motion, and is meaſured by the *change* which accompanies its exertion. There is ſome difference between the parties about the way of eſtimating this meaſure; but all agree in making, not the motion, but the change of motion, the baſis of the meaſurement. Now we ſhewed, at great length, in the article Dynamics, that the *change* of motion, in every caſe, is that motion which, when compounded with the former motion, conſtitutes the new motion. Did we take the new motion itſelf as the characteriſtic and meaſure of the changing force, it would be different in every different previous ſtate of the body, and would neither agree with our general notion of force, nor with the knowledge that we have of the actual preſſures and other moving forces that we know. The ſole reaſon why the previous motion is equivalent with a force is, that the only mark or knowledge that we have of a moving force is the motion which it is conceived to produce. The force is equivalent with the previous motion, becauſe we know nothing of it but that motion; and the name that we give it, only marks ſome external thing to which it has an obſerved relation. We call it magnetiſm or electricity, becauſe we obſerve that a magnet or an electrified body gives *occaſion* to its appearance. We never obſerve the reſiſtance of *inertia*, except in caſes where we know, from other circumſtances, that moving forces inherent in bodies are really brought into action. The inertia of the ball which has been moved by a ſtroke of another, is inferred from the diminution of that other's motion. But this is occaſioned preciſely in the ſame way as the diminution of the motion of the magnet A in the firſt example; an event which every unprepoſſeſſed perſon aſcribes to the repulſion of B in the oppoſite direction, and not to its inertia.

Anſwered.

We truſt that our readers are not diſpleaſed with this detail of the procedure of Nature in the phenomena of impulſion. It has been prolix; becauſe we apprehend, that the too ſynoptical manner in which the laws of colliſion have always been delivered, leaves the mind in great obſcurity concerning the connection of the events. General facts have been taken for philoſophical principles and elementary truths; whereas they were deductions from the ſum total of our knowledge. They were very proper logical principles for a ſynthetical diſcuſſion; but their previous eſtabliſhment as general facts was neceſſary. We have eſtabliſhed the two moſt general facts from which the reſult of every colliſion may be deduced with the utmoſt eaſe. The firſt is, that in the inſtant of greateſt compreſſion, the common velocity is $=\frac{A\,a \pm B\,b}{A+B}$; and we have ſhewn, that this is applicable to the colliſion of unelaſtic bodies. The ſecond is, that the change in perfectly elaſtic bodies is double of the change in unelaſtic bodies. The *conſervatio momentorum*, and the *conſervatio virium vivarum*, are alſo general facts; or rather they are the ſame mentioned with thoſe above, conſidered in another aſpect. They may all be uſed as the principles of a ſynthetic treatiſe of impulſion; and they have been ſo employed. Each has its own advantages.

65
Principle of ſmalleſt action.

Mr Maupertuis gives a treatiſe on the Communication of Motion, that is, of impulſion or colliſion, which has the appearance of being deduced from a new principle, which he calls the PRINCIPLE OF SMALLEST ACTION. He ſuppoſes, that perfect wiſdom will accompliſh every thing by the ſmalleſt expenditure of action; and he chanced to obſerve, in the equations employed in the common doctrine of impulſion, a quantity which is always a minimum. He chooſes to conſider this as the expreſſion of the action.

His principle or axiom, deduced from the perfect wiſdom of God, is thus expreſſed: "When any change happens in nature, the quantity of action neceſſary for it is the ſmalleſt poſſible." And then he adds,

"In mechanical changes, the quantity of action is the product of the quantity of matter in the body by the ſpace paſſed over, and by the velocity of the motion." This is evidently the meaſure adopted long before by

Leibnitz (ſee *Phil. Tranſ.* vol. xliii. p. 423, &c.), and it is equivalent to $m v^2$; becauſe the ſpace multiplied by the velocity is as the ſquare of either. We refer to Dr Jurin's remarks on this paſſage for proof that this is by no means a juſt meaſure of action; and only obſerve here, that we can form no other notion of velocity than that of a certain ſpace deſcribed in a given time. The change produced is not the actual deſcription of a line, but the determination to that motion. It is in this reſpect alone that the condition of the body is changed; and therefore the product $m v$, and not $m s v$, is the proper meaſure of the action. On the authority of this maxim of divine conduct, Maupertuis inveſtigates the reſults which will make this quantity a minimum, and aſſerts that theſe *muſt* be the laws of colliſion. Luckily this inveſtigation is extremely ſimple, and very neat and perſpicuous; and it gives very eaſy ſolutions. For example, the unelaſtic body A, moving with the velocity *a*, overtakes the unelaſtic body B, moving with the velocity *b*. Both move after the colliſion with the velocity *x*. This velocity is required. To determine this, we muſt make $A \times \overline{a - x}|^2 + B \times \overline{x - b}|^2$ a minimum: or $A a^2 - 2 A a x + A x^2 + B x^2 - 2 B b x + B b^2$ is a minimum. Therefore $- 2 A a \dot{x} + 2 A x \dot{x} + 2 B x \dot{x} - 2 B b \dot{x} = 0$, or $2 A a + 2 B b = 2 A x + 2 B x$, and $x = \frac{A a + B b}{A + B}$; as we have already ſhewn it to be.

The amiable and worthy author grew more fond of his theory, when he ſaw what he imagined to be its influence extended to an immenſe variety of the operations of nature. Euler demonſtrated, that the quantity called *action* by Maupertuis was a minimum in the planetary motions, and indeed in all curvilineal motions in free ſpace. But all the while, this principle of leaſt action is a mere whim, and the formula which is ſo generally found a minimum has no perceptible connection with the quantity of action. In many caſes to which Maupertuis has applied it, the concluſions are in direct oppoſition to any notion that we can form of the economy of action. Nay, it is very diſputable whether it does not, on the contrary, expreſs the greateſt want of economy; namely, a minimum of effect from a given expenditure of power. In the caſe of impulſion, this minimum is the mathematical reſult of the equality and oppoſition of action and reaction. Maupertuis might have pleaſed his fancy by ſaying, that it became the infinite wiſdom of God to make every primary atom of matter alike; and this would have anſwered all his purpoſe.

66
Enquiry into the diſtribution of impulſe from the point that is ſtruck.

There ſtill remains to be conſidered a very material circumſtance in the doctrine of impulſion, which produces certain modifications of the motions that are of mighty practical importance. We have contented ourſelves with merely ſtating the moving force that is brought into action in the points of phyſical contact; but have not explained how this produces the progreſſive motion of every particle of the impelled body, and what motion it really does produce in the remote particles. A body, beſides the general progreſſive motion which it receives from the blow, is commonly obſerved to acquire alſo a motion of rotation, by which it whirls round an axis. It has not been ſhewn, that when a body has received an impulſe by a blow in a particular direction on one point, it will proceed in that direction, or in what direction it will proceed. Experience ſhews us, that this depends on circumſtances not yet conſidered. The billiard player knows, that by a ſtroke in one direction he can make his antagoniſt's ball move in a direction extremely different.

Theſe are queſtions of great intricacy and difficulty, and would employ volumes to treat them properly. We have already enlarged this article till we fear that we have exhauſted the reader's patience, and deviated from the proportion of room juſtly allowable to IMPULSION. We muſt therefore limit our attention to ſuch things only as ſeem elementary, and indiſpenſably neceſſary for a uſeful application of the doctrine of impulſion.

With reſpect to the *direction* of the motion produced by impulſion, the very example juſt now borrowed from billiard playing, ſhews that it is important, and by no means obvious. We are ſorry to ſay, that we have nothing to offer in ſolution of this queſtion that will be received by all as demonſtration. It is comprehended in the following propoſition, which we bring forward merely as a matter of fact.

67
Action of bodies by contact is perpendicular to the touching ſurface.

The direction of the ſtroke or preſſure exerted by two bodies in phyſical contact, is always perpendicular to the touching ſurfaces. Of this truth we have a very diſtinct and pretty example and proof by the billiard table. If two balls A and B (fig. 2.) are laid on the table in contact, and A is ſmartly ſtruck by a third ball C in any direction C*c*, ſo that the line *a* A, which joins the point of contact *a* with the centre A, may make an obtuſe angle with the line A B, joining the centres of the two balls, the ball B will always fly off in the direction ABF. The preſſure on B, which produces the impulſion, is evidently exerted at the point *b* of contact, and the direction BF is perpendicular to the plane G *b* H, touching both balls in the point *b*. The primary ſtroke is at *a*, and acts in the direction *a* A, although C moved in the direction C*c*. Had A been alone, it would have gone off in the direction *a* A produced. But the force acting in the direction *a* A is equivalent to the two forces *a d* and *d* A, of which *d* A preſſes the ball on B at *b*, and produces the motion. In like manner, another ball E, ſo laid that *b* B *e* is obtuſe, will fly off in the direction ED, which may even be oppoſite to C*c*. Theſe are matters of fact; not indeed preciſely ſo, becauſe billiard balls are not perfectly elaſtic, reſtoring their figure with a promptitude equal to that of their compreſſion; and alſo becauſe there is a little friction, by which the point *a* of the ball A is dragged a little in the direction of C's motion. This may both give a twirl to A, and diminiſh its preſſure on B. The general reſult, however, is abundantly agreeable to the doctrines now delivered. But we wiſh to ſhew on what properties of tangible matter this depends; and although we dare not hope for implicit belief, we expect ſome credit in what we ſhall offer.

Demonſtration.

We have evident proof, that at a diſtance which is not unmeaſurable by its minuteneſs, and certainly far exceeds the 900th part of an inch, bodies repel each other with very great force. This diſtance alſo far exceeds the diſtance between the particles, if theſe are diſcrete. Let *m n* (fig. 3.) be the diſtance at which a particle repels another, and let P be a particle ſituated at a leſs diſtance than mn from the ſurface AC of a ſolid body. With a radius PA, equal to mn, deſcribe a ſegment of a ſphere ABC, and draw PB perpendicular to AC. It is plain, that every particle of matter in the ſegment ABC repels the particle P, and that it is not affected by any more. Let D be any ſuch particle. It repels P in the direction DP. But there is another particle *d* ſimilarly ſituated on the other ſide of PB. This will repel P with equal force in the direction *d*P. Therefore the two particles D and *d* will produce a joint repulſion in the direction BP. The like may be ſaid of every particle and its correſponding one on the other ſide of PB. Therefore the joint repulſion of all the matter in the ſegment will have the direction BP. It is plain, that the radius of curvature of every ſenſible figure may be conſidered as immenſely great in compariſon of mn; and therefore the propoſition is manifeſt.

This is a propoſition of very great importance to the artiſt and the engineer, as well as to the philoſopher. In all the connections of engines and machines, the mutual action is regulated by this fact. The mutual preſſure at the contacts of the teeth of wheels and pinions depend ſo much on it, that it is eaſy to make them of ſuch a ſhape that they ſhall produce no force whatever that is of any ſervice; and it requires a ſkilled attention to their forms to obtain the ſervice we want. This will be conſidered with ſome care in the article MACHINE.

Having thus diſcovered the *direction* of the real impulſion, and that it may be very different from that of the force exerted, we proceed to conſider what will be the direction and velocity of the motion, and whether it will be accompanied with any rotation.

68

A ſtroke, whoſe action paſſes through the centre of a portion of ſolid body, impels it without rotation.

Our readers are acquainted with the elementary mechanical property of the centre of gravity. If a body be ſupported at this point by a force acting vertically upwards, and equal to the united weight of every particle of matter in it, it will not only remain at reſt, but will have no tendency to incline to either ſide; that is, the upward force balances the weight of the whole body, and the mechanical momenta of all the heavy particles balance each other, like the weights in the ſcales of a ſteelyard. That this may be the caſe, we know that if the weight of every particle be multiplied into the horizontal lever by which it hangs (which is a line drawn from the particle perpendicular to a vertical plane paſſing through the centre of gravity), the ſum of all the products on one ſide muſt be equal to the ſum of all the products on the other ſide. Therefore, if we ſuppoſe the particles all equal, and repreſent each by unity, the ſums of all the perpendiculars themſelves muſt be equal. How is this balancing effected? Every particle tends downwards with a certain force. It muſt therefore be kept up by a force *preciſely* equal and oppoſite. This muſt be propagated to the particle by means of the connecting corpuſcular forces. The force propagated to any particle is equal and oppoſite to the force acting on that particle, which it balanced; and if not balanced, it would produce a motion equal and oppoſite to that produced by the other force. Gravity would cauſe every particle to deſcend equally; therefore the force which, by acting on one point, excites thoſe balancing forces on each particle, would cauſe them to move equally upwards. And ſince this is true in *any* attitude of the body, it follows, that a force, acting in *any* direction through the centre of gravity, will cauſe all the particles to move in that direction equally; that is, without rotation.

Hence we learn, that when the direction of the ſtroke given to any body paſſes through the centre of gravity, the body will move in that direction without any rotation. If the quantity of matter, or number of equal particles in the body, be m, the moving power P will impreſs on each particle an accelerating force f, equal to the mth part of P. Therefore $f = \frac{P}{m}$, and $P = mf$. An accelerating force is eſtimated by the velocity v, which it generates by acting uniformly during ſome time t, or $v = ft$, and $f = \frac{v}{t}$, and $P = m\frac{v}{t}$, and $v = \frac{P}{m}t$. The ſymbol t may be omitted, if we reckon every force by the velocity which it can produce in a ſecond. Thus may all forces be compared with gravity, by taking 32 feet for the meaſure of gravity. Then mv will expreſs the number of pounds which give a preſſure equal to the force under conſideration. Thus if the force can generate the velocity 48 feet per ſecond in 100 pounds of matter, by acting on it uniformly during a ſecond, its preſſure is equal to the weight of 150 pounds.

This is *direct* IMPULSION.

When a body A, moving with the velocity *a*, overtakes or meets a body B, moving with the velocity *b*, and the line perpendicular to their touching ſurfaces paſſes through the centres of both in the direction of their motion, all the circumſtances of the colliſion are determined by the rules already laid down. This is called DIRECT IMPULSE; and it is this which admits the application of the ſimple doctrines of impulſion, deduced, as we have done it, from the action of accelerating forces. All that was ſaid of the changes of motion produced in the magnets obtain here without any farther modification.

We may juſt be allowed to take notice of a curious obſervation of Mr Huyghens on the colliſion of perfectly elaſtic bodies. Inſtead of impelling the elaſtic ball C by the ſtroke of the elaſtic ball A, we may cauſe A to ſtrike an intermediate ball B (alſo perfectly elaſtic), which is lying in contact with C. In many caſes, the ball B will not ſtir ſenſibly from its place, and C alone will fly off. Nay, if a long row of equal billiard balls lie in contact, and one of the extreme balls be hit by another ball in the direction of the row, only the remote ball of the row will fly off. All this is eaſily ſeen and underſtood, by conſidering them as bodies mutually repelling, and placed at the limits of their mutual action. Or even ſuppoſing them elaſtic balls, at a very ſmall diſtance from each other: The ball employed to ſtrike the firſt comes to reſt, and the ſtricken ball moves off with its velocity: It ſtrikes the ſecond ball of the row, and is brought to reſt: The ſecond ſtrikes the third, and is brought to reſt: And this goes on in ſucceſſion to the laſt, which is the only one that *can* fly off. The curious obſervation of Mr Huyghens is, that a greater velocity will be communicated by a large ball to a ſmall one, if we employ the intermedium of another ball of a ſize between the two; and that the velocity will be the greateſt poſſible when the intermediate ball is a mean proportional (geometrical) between the two. This is alſo eaſily deduced from the ſimilar attention to the action of the accelerating forces, or from the ſuppoſition of ſucceſſive impulſes. From this it alſo follows, that a greater velocity will be produced by the intervention of two, three, or more, mean proportionals.

69 *Oblique* IMPULSION.

But the direction of the ſtroke may not be the ſame with that of the motion. This is called OBLIQUE IMPULSE. The caſes of oblique colliſions are extremely different, according to the directions of the motions; and the reſults are, in many of them, far from being obvious. But we have not room for a particular treatment of them. We ſhall therefore avail ourſelves of ſome of the general facts mentioned above, by means of which we may reduce all the varieties to ſome eaſy caſes. The moſt ſerviceable general facts are: 1. That the actions of bodies on each other depend on their relative motions; and, 2. That the motion of the common centre is not changed by the colliſion. Theſe enable us to reduce all to the caſe of a body in motion ſtriking another at reſt. We have only to determine their relative motion by the propoſition in DYNAMICS, nº 67. and then to ſuperadd the common motion, which changes the relative into the true motions. Thus, if two bodies A and B (fig. 4.) meet in D, deſcribing the lines AD, BD, the colliſion is the ſame as if B had remained at reſt, and A had come againſt it with the motion AB. In the mean time, the common centre of poſition has deſcribed CD. If the bodies are unelaſtic, they remain united, and proceed in the line CD produced toward E, and their common velocity will be repreſented by DE equal to CD, if AD and BD repreſented their initial velocities. If the bodies are elaſtic, they ſeparate again, and they ſeparate from the common centre in the oppoſite direction, and with the ſame velocities with which they approached it. Therefore draw *a* E*b* parallel to ACB, and make E *a*, E *b* equal to CA and CB, and then D *a* and D *b* are the paths and velocities of the bodies. All this is abundantly plain, and is a neceſſary deduction from the general principle, that the motion of the centre is not affected by any equal and oppoſite forces which connect the bodies of a ſyſtem.

70 Often accompanied by rotation.

But this great ſimplicity is not ſufficient for aſcertaining the reſults of colliſion which occur in many of the moſt important caſes. It not only ſuppoſes that AD and ED are exactly proportional to the velocities of A and B, but alſo that they meet, ſo that the plane of mutual contact is perpendicular to the line AB, and that the ſtroke on each is directed to its centre. Theſe circumſtances will not always be combined, even in the caſe of ſpherical bodies. The conſequence will be, that although the motion of the centre remains the ſame, that of the bodies may ſometimes be different. We muſt therefore give a general propoſition, which will, with a little trouble, enable the reader to determine all the motions which can take place, whether progreſſive or rotative.

71 General theorem.

Let the body A (fig. 5.), moving with the velocity V, in the direction AD, ſtrike the body B at reſt. Let F be the point of mutual contact, and *h* FH a plane touching both bodies in F. Draw AFP perpendicular to this tangent plane, and through G, the centre of poſition of B, draw PGC perpendicular to FP, and GI parallel to FP. Let C, in the line PG, be the ſpontaneous centre of converſion (ROTATION, *Encycl.* nº 77, &c.), correſponding to the point of percuſſion F. Join CF. Let the direction cut the tangent plane in H, and PF in A; and let AH repreſent the velocity V.

The impulſe is made at the point F, in the direction AF or FP, and the centre of poſition of the body B will advance in the direction GI parallel to FP, the direction of the effective impulſe. But, becauſe this does not paſs through the centre G, the body will advance, and will alſo turn round an axis paſſing through G, perpendicular to the plane of the lines GP, PF, and the ſpontaneous axis of converſion will paſs through ſome point C of the line PG, and will alſo be perpendicular to the ſame plane. All this has been demonſtrated in the article ROTATION, nº 94, &c. Complete the parallelogram AFHE. It is plain, that the motion AH is equivalent to AE and AF. By the motion AE, A only ſlides along the ſurface of B, without preſſing it, or cauſing any tendency to motion in that direction, except perhaps a little ariſing from friction. It is by the motion AF alone that the impulſe is made.

72 Efficient velocity.

Therefore let v be $= V \times \frac{AF}{AH}$; and then $A \times v$ may be called the *efficient impulſe* of the body A in the preſent circumſtances, and v the *efficient velocity*. This will be diminiſhed by the colliſion. Let x be the unknown velocity remaining in A after the colliſion, or rather in the inſtant of the greateſt compreſſion and common motion of the touching points of A and B, eſtimated in the direction FP. The effective momentum loſt by A muſt therefore be $A \times \overline{v - x}$: but the ſame muſt be gained by B, and its centre G muſt move in the direction GI, parallel to FP, with this momentum; and therefore with the velocity $\frac{A \times \overline{v - x}}{B}$. That this may be the caſe, the point of percuſſion F muſt yield with the velocity x, becauſe the bodies are in contact. But becauſe C is the ſpontaneous axis of converſion, every particle is *beginning* to deſcribe an arch of a circle round this axis. Therefore F is beginning to move in the direction Fg, perpendicular to the momentary radius vector CF. Let Fg be a very minute arch, deſcribed in a moment of time. Draw gf perpendicular to FP. Then Ff is the motion Fg reduced to the direction FP, and will expreſs the yielding of B in the direction of the impulſe, while G deſcribes a ſpace equal to $\frac{A \times \overline{v - x}}{B}$, and A deſcribes a ſpace x. Therefore Fg will expreſs x. Let Pp be the ſpace deſcribed in the ſame time that Fg is deſcribed. Draw pC, cutting GK in the point I. GI is the yielding of the body B to the impulſe, and muſt therefore be equal to $\frac{A \times \overline{v - x}}{B}$.

The triangles Ffg and CPF are ſimilar; for the angle CFP is the complement of fFg to a right angle: It is alſo the complement of PCF to a right angle. Therefore Fg : Ff = FC : CP. But Fg : Pp = FC : CP; becauſe the little arches Fg, Pp have the ſame angle at C. Therefore Pp = Ff, = x. It is plain, that CG : CP = GI : Pp. Therefore CG : CP =

$= \frac{A\times\overline{v-x}}{B} : x$, and $x = \frac{A\times\overline{v-x}\times CP}{B\times CG}$, or x $= v\times\frac{A\times CP}{B\times CG} - x\times\frac{A\times CP}{B\times CG}$; wherefore $x \times B\times CG + x\times A\times CP = v\times A\times CP$, and $x\times\overline{B\times CG + A\times CP} = v\times A\times CP$, and $x = v\times\frac{A\times CP}{B\times CG + A\times CP}$, = the velocity remaining in A, eſtimated in the direction FP.

73 Unelaſtic bodies may ſeparate.

And u, the velocity with which G will advance, is $x\,\frac{CG}{CP}$; for CP : CG = Pp : GI, = $x : u$. It is evident that A will change its direction by the colliſion: For in the inſtant of greateſt compreſſion it was reacted on by a force = A × $\overline{v-x}$ in the direction FA. This muſt be compounded with A × V, in the direction AH, in order to obtain the new motion of A; or it may be found by compounding x, which is retained by A, with FH, which has ſuffered no change by the colliſion. The bodies will therefore ſeparate, although they be unelaſtic: If they are elaſtic, we muſt double theſe changes on each. If B was alſo in motion before the colliſion, the motion of A muſt be reſolved into two, one of which is equal and parallel to the motion of B: the other muſt be employed as we have employed the motion AH.

Expreſſions ſtill more general may be obtained for x and u; namely, by taking the formulæ for the centres of converſion and percuſſion (Rotation, n° 96, 99.)

$$CG = \frac{\int pr^2}{B\times GP}, \text{ and } CP = \frac{\int pr^2 + B\times CP^2}{B\times GP},$$

where p ſtands for a particle of matter, and r for its diſtance from an axis paſſing through G perpendicularly to the plane of the lines GP and PF. In this way we obtain

$$x = v\,\frac{A\cdot\int pr^2 + A\cdot B\cdot GP^2}{\overline{A+B}\cdot\int pr^2 + A\cdot B\cdot GP^2}.$$

74 Change of progreſſive motion greateſt when the direction of the effective ſtroke paſſes thro' the centres.

It is plain, from this propoſition, that the progreſſive motion of the body depends, not only on the momentum of the impelling body, but alſo on the place where the other ſtroke is: For even although the original momentum of A be the ſame, and the obliquity of the ſtroke making v the ſame, and the body (and conſequently $\int pr^2$) alſo remain the ſame, we ſee that x and u depend on the ratio of CP to CG. Now C and P are always on oppoſite ſides of G: Conſequently, by removing the direction FP of the impulſion farther from G, we diminiſh CG and increaſe CP; and therefore increaſe the value of $x = v\,\frac{A\cdot CP}{B\cdot CG + A\cdot CP}$; and conſequently diminiſh the value of A × $\overline{v-x}$, to which B × u is equal. The greateſt momentum of B is produced when the direction of the impulſe paſſes through G, and no rotation is produced. Indeed we are led, by a ſort of common ſenſe, to expect this.

75 Importance of this theory to ſeamanſhip, &c.

This inveſtigation is by no means a piece of mere ſpeculative curioſity. It is the ſolution of the greateſt problem in practical mechanics. It is in this way that we muſt proceed in computing the actions of the wind and water on the ſails and hull of a ſhip. Were it not that many circumſtances concur in determining ſeveral of the preparatory ſteps, it is evident that the taſk muſt be almoſt impracticable. But the preſſure and its direction are generally determined by experiment, without the trouble of computation; and we are ſeldom ſolicitous about the ſubſequent motion of the wind or water.

76 Impulſion on bodies confined to particular paths.

There is another queſtion in impulſion which is of the firſt practical importance—namely, when the impulſe is exerted on the parts of a machine, where the body ſtruck is not at liberty to yield freely to the ſtroke, but muſt ſlide along ſome ſolid path, or turn round ſome axis, or take ſome other conſtrained motion. The operations of moſt engines depend on this. The operation of wedges, axes, and many cutting and piercing inſtruments, and the penetration of piles, impelled by a rammer, are all aſcertained by the ſame doctrines. But the particular applications can ſcarcely be elucidated by any claſſification that occurs to us, the circumſtances of the caſe making ſuch great difference in the reſult, both in kind and degree. For example, in the ſimpleſt caſe that occurs, the driving of piles, the penetration of the pile depends, in the firſt place, on the momentum of the rammer. If the maſs of the pile be neglected, the penetration through a uniformly reſiſting ſubſtance will be as the ſquare of the velocity of the rammer, (Dynamics, *Suppl.* n° 95), and its abſolute quantity may be determined from a knowledge of the proportion of the weight of the rammer to the reſiſtance of the earth. But when we conſider that we have to put in motion the whole matter of the pile, we learn that a great diminution of the effect muſt take place. We ſtill can compute what this muſt be, becauſe we have the ſame momentum, with a velocity diminiſhed in a certain proportion of the ſum of the matter in the rammer and pile, to that in the rammer alone.—Another defalcation ariſes from friction, which continually increaſes as the pile goes deeper;—and a ſtill greater defalcation proceeds from the nature of the pile. If it is a piece of very dry ſtraight grained fir, it is very elaſtic, and acquires almoſt a double velocity from the ſtroke of a rammer of caſt iron. If it is moiſt and ſoft, eſpecially if it is oak, or other timber of an undulated fibre, it does not acquire ſo great velocity, and the penetration is very much diminiſhed. It is probable that a pile, headed with moiſt cork, could not be driven at all. The writer of this article found a remarkable effect of the elaſticity in the proceſs of boring limeſtone. When the boring bit was made entirely of ſteel, and tempered through its whole length to a hard ſpring temper, the workman bored three inches, in the ſame time that another bored two inches with a bit made of ſoft iron; and he would never uſe any but ſteel bits, if they could be hindered from chipping by the hammer (which muſt alſo be of tempered ſteel throughout). This has hitherto baffled many attempts. A pretty large round head, like a marlin ſpike, has ſucceeded beſt: but even this cracks after ſome days uſe. The improvement is richly worth attention; for the workman is delighted by feeling the hammer riſe in his hand after every ſtroke, and ſays that the work is not ſo hard by half. *N. B.* The ſtone cutters at Liſbon and Oporto uſe iron mallets.

77 Impulſion on machines.

The caſe of impulſion made on part of a machine moveable round an axis has been conſidered in the article Rotation, *Encycl.* n° 72; where x is ſhewn to be $= v \times \frac{A.\,CP^2}{\int p\, r^2 + A.\,CP^2}$. But, in this formula, r denotes the diſtance of p from the point C, and not from G. $\int p\, r^2$ in this formula, is B. CG. CP; whereas, in the formula for a free body, where r is the diſtance of a particle from G, $\int p\, r^2$ is $=$ B. CG. GP.

In the practical conſideration of this queſtion, the reader will do well to conſider the whole of that article with attention. Many circumſtances occur, which make a proper choice of the point of impulſe, and the direction of the tangent plane, of the greateſt conſequence to the good performance of the machine; and there is nothing in which the ſcientific knowledge of the engineer is of more eſſential ſervice to him. An engineer of great practice, and a ſagacious combining mind, collects his general obſervations, and ſtores them up as rules of future practice. But it is ſeldom that he poſſeſſes them with that diſtinctneſs and confidence that can enable him to communicate his knowledge to others, or even ſecure himſelf againſt all miſtakes; whereas a moderate acquaintance with theſe *elements* of real mechanics, may be applied with ſafety on all occaſions, becauſe arithmetical computations, when rightly made, afford the moſt certain of all reſults.

78 Great loſs of power by the yielding and bending of the material.

There is a circumſtance which greatly affects the performance of machines which are actuated by impulſes, namely, the yielding and bending of the parts. When the moving power acts by repeated ſmall impulſions, it may ſometimes be entirely conſumed, without producing any effect whatever at the remote working point of the machine; and the engineer, who founds his conſtructions on the elementary theories to be had in moſt treatiſes of mechanics, will often be miſerably diſappointed. In the uſual theories, even as delivered by writers of eminence, it is aſſerted, that the ſmalleſt impulſe will ſtart the greateſt weight. But ſince impulſe is only a continued preſſure, and requires time for the tranſmiſſion of its effect through the parts of a yielding ſolid, it is plain that the motion of the impelling body may be extinguiſhed before it has produced compreſſion enough for exciting the forces which are to raiſe the remote parts of a heavy body from the ground. What blow with a hammer could ſtart a feather bed? Much oftener may we expect, that a blow, given to one arm of a long lever, will be conſumed in bending the whole of its length, ſo as to bring the remote end into action. Therefore great ſtiffneſs, and perfect elaſticity, both in the moving parts and in the points of ſupport, are neceſſary for tranſmitting the full, or even a conſiderable part, of the power of the impelling body. Perhaps not the half of the blow given by the wipers of a great forge or tilting mill to the ſhank of the hammer is tranſmitted in the *proper* inſtant of time to the hammer-head. The hammer, while it is toſſed up by the blow, is quivering as it flies. Should it reach the ſpring above it in the time of its downward vibration, it will not be returned with ſuch force as if it had hit the ſpring a moment before or after. A quarter of an inch will produce a great effect in ſuch caſes. It is found, that the minute impulſes given to the pallets of a clock or watch loſe much of their force by the imperfect elaſticity of the pendulum or balance. We muſt therefore make all the parts which tranſmit the blow to the regulating maſs of matter as continuous, hard, elaſtic, and ſtiff, as poſſible. The performance of ruby pallets is very ſenſibly weakened by putting oil on the face of them, eſpecially in the detached ſcapements, which act partly by impulſe. A wheel of hard tempered ſteel, working on a dry ruby pallet, excels all others. The intelligent engineer, ſeeing that, after all his care, much impulſion is unavoidably loſt, will avoid employing a firſt mover which acts in a ſubſultory manner, and will ſubſtitute one of continued preſſure when it is in his power. This is one chief cauſe of the great ſuperiority of overſhot water-wheels above the underſhot.

We can now underſtand how it happens that Galileo, Merſennus, and others, could compare the impulſe given by a falling body with the preſſure of a weight in the oppoſite ſcale of a balance, and can ſee the reaſon of the immenſe differences, yet accompanied by a ſort of regularity, in the reſults of the experiments. Galileo, Merſennus, and Riccioli, found them to be proofs that the forces of moving bodies are as their velocities; becauſe the heights from which the body fell were as the ſquares of the weights ſtarted from the ground. Graveſande found the ſame thing as long as he held the ſame opinion; but when he adopted the Leibnitzian meaſure, he found many faults in the apparatus employed in his former illuſtrations, and altered it, till he obtained reſults agreeable to his new creed. But any one who examines with attention all that paſſes in the bending of the apparatus, and takes into account the maſs of matter which muſt be diſplaced before the oppoſite arm riſes ſo far as to detach the ſpring which gives indication of the magnitude of the ſtroke, muſt ſee that the agreement is purely accidental, and may be procured for any theory we pleaſe (ſee *Graveſande's Nat. Phil.* tranſlated by Deſaguiliers, vol. i. p. 241. &c.). The propoſition, n° 95, Dynamics, ſuffices for explaining every thing that can happen in ſuch experiments. And it will ſhew us, that although the motion of impulſion is produced by preſſure alone, yet impulſe is incomparable with mere preſſure: It is not infinitely greater, but diſparate. A weight (which is a preſſure) bends a ſpring to a certain degree, and will derange to a certain degree the fibres of a body on which it preſſes, before it be balanced. The ſame weight, falling on this ſpring from the *ſmalleſt* height, will bend it farther, and may cruſh or ſhiver to pieces the body which would have carried it for ever. We ſhall make ſome further remarks on this ſubject, of great practical importance, under the word Percussion.

79 Concluſion.

The method which we have purſued in conſidering the doctrines of impulſion, differs conſiderably from that which has generally been followed; but we truſt that it will not be found the leſs inſtructive. Although the reader ſhould not adopt our decided opinion, that we have no proof of pure impulſion ever being obſerved, and that all the phenomena which go by that name are really the effects of preſſures, analogous to gravity, he perceives that our opinion does not lead to any general laws of impulſion that are different from thoſe which are acknowledged by all. We differ only, by exhibiting the internal procedure by which they are *unqueſtionably* produced in a vaſt number of caſes, and which takes place in all that we have ſeen, in ſome degree. Our method has undoubtedly this ad-

GUILLOTINE. PLATE XXIX.

Fig. 1.

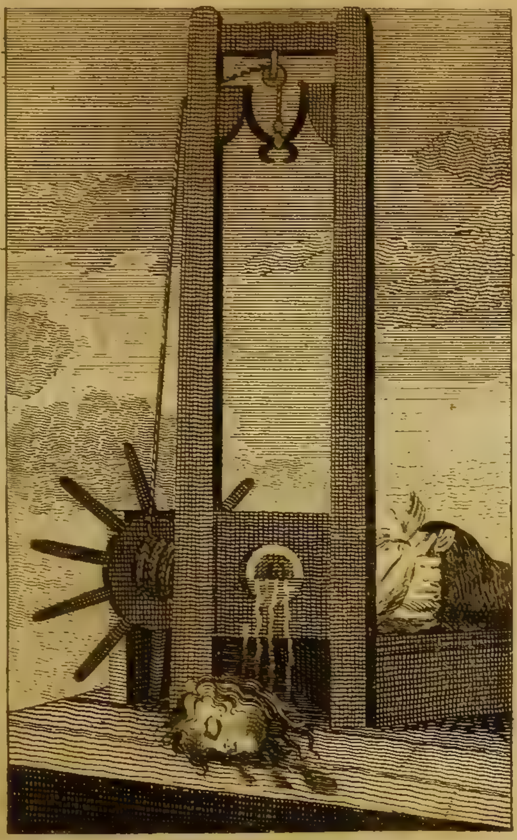
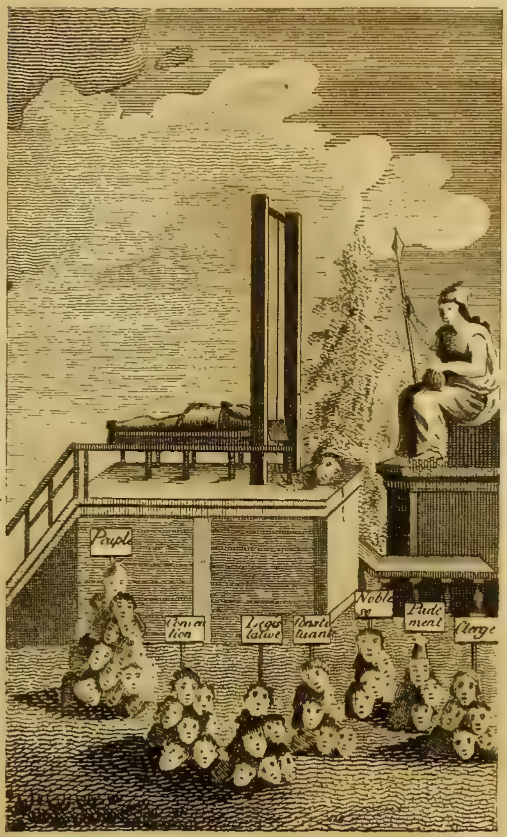


Fig. 2.



IMPULSION

Fig. 1.

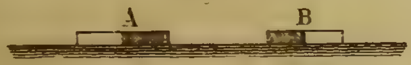


Fig. 2.

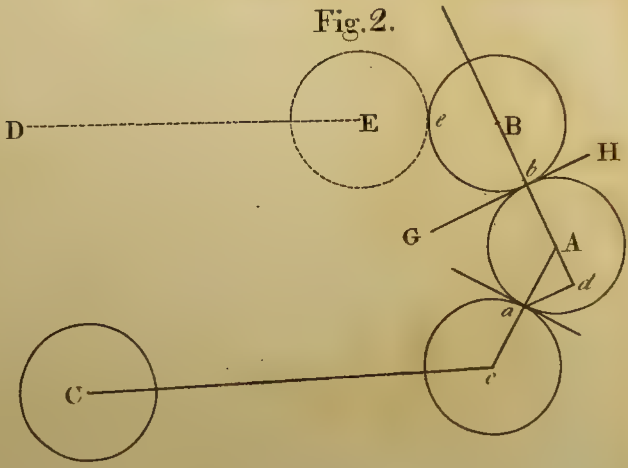


Fig. 3.

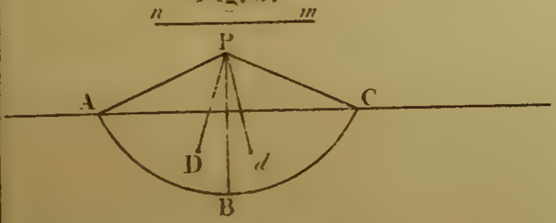


Fig. 4.

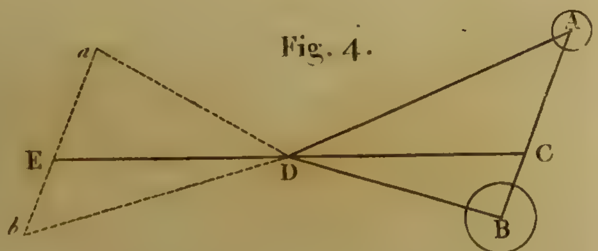
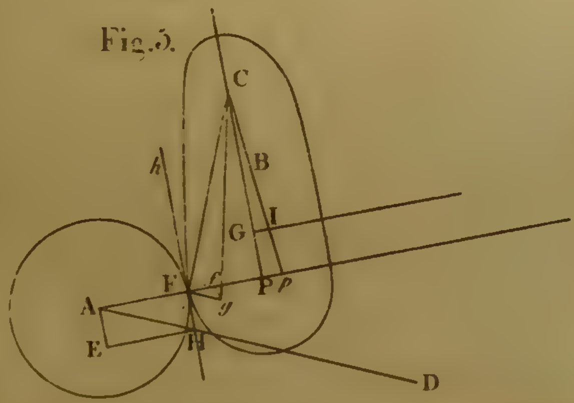


Fig. 5.



Draper

vantage, that it requires no principle but one, namely, that accelerating forces are to be eſtimated by the acceleration which they produce. Even this may be conſidered, not as a principle, but merely as a definition—We get rid of all the obſcurity and perplexity that reſult from the introduction of inertia, conſidered as a power—a power of doing nothing—and we are freed from the unphiloſophical fiction (adopted by all the abettors of that doctrine, and even by many others) of conceiving the ſpace, in which motions are performed, and bodies act, to be carried along with the bodies in it.—This furniſhes, indeed, in ſome caſes, a familiar way of conceiving the thing, by ſuppoſing the experiments to be made in a ſhip under ſail, and by appealing to the fact, that all our experiments are made on the ſurface of a globe that is moving with a very great velocity. But it is an abſurdity in philoſophy, and, when minutely or argumentatively uſed, it does not free us from one complication of action; for, before we can make uſe of this ſubſtitution, we muſt demonſtrate, that the actions depend on the relative motions only: And this, when demonſtrated, *obliges* us to meaſure forces by the velocity which they produce.

As no part of mechanical philoſophy has been ſo much debated about as impulſion, it will ſurely be agreeable to our readers to have a notice of the different treatiſes which have been publiſhed on the ſubject:

Galilei Opera, T. I. 957. II. 479, &c.

Jo. Walliſii Tractatus de Percuſſione. Oxon. 1669.

Chr. Hugenius de Motu Corporum ex Percuſſione. Op. II. 73.

Traité de la Percuſſion des Corps, par Mariotte, Op. I. 1.

Hypotheſis Phyſica Nova, qua phenomenorum cauſæ ab unico quodam univerſali motu in noſtro globo ſuppoſito repetuntur. Auct. G. G. Leibnitzio. Moguntiæ 1671.—Leibn. Op. T. II. p. II. 3.

Ejuſdem Theoria Motus Abſtracti. Ibid. 35.

Hermanni Phoronomia. Amſt. 1716.

Diſcours ſur les Loix de la Communication de Mouvement, par Jean Bernoulli, Paris, 1727. Jo. Bern. Oper. III.

Dynamique de D'Alembert.

Euleri Theoria Corporum ſolidorum ſeu rigidorum, 1765.

Borelli (Alphons) de Percuſſione.

See alſo M'Laurin's Fluxions, and his Account of Newton's Philoſophy, for his Diſſertation crowned by the Acad. des Sciences at Paris.—Alſo Dr Jurin's elaborate diſſertations in the Phil. Tranſ. N° 479.—Alſo Graveſande's Nat. Philoſophy, where there is a moſt laborious collection of experiments and reaſonings; all of which receive a complete explanation by the 39th Prop. Princip. Newtoni I. or our n° 95. Dynamics. There are alſo many very acute philoſophical obſervations in *Lambert's Gedanken über die Grundlehren des Gleichgewichts, und der Bewegung*, in the ſecond part of his Gebrauch der Mathematik.—Alſo, in the works of Kaeſtner, Hamberger, and Buſch. Muſchenbroeck alſo treats the ſubject at great length, but not very judiciouſly. We do not know any work which treats it with ſuch perſpicuous brevity as M'Laurin's Account of Newton's Philoſophy.

INAGUA, *Great and Little*, two ſmall iſlands in the Windward Paſſage, N. W. of the iſland of St Domingo, and N. E. of the iſland of Cuba.—*Morſe.*

INATTENDUE *Iſland*, (the Gower Iſland of Carteret) ſo named by Surville, lies on the north ſide of the iſlands of Arſacides, 2° 4′ eaſt of Port Praſlin.—*ib.*

INCAI, a ſouthern branch of Amazon river, in S. America.—*ib.*

INCREMENT, is the ſmall increaſe of a variable quantity. Newton, in his Treatiſe on Fluxions, calls theſe by the name *Moments;* and obſerves, that they are proportional to the velocity or rate of increaſe of the flowing or variable quantities in an indefinitely ſmall time. He denotes them by ſubjoining a cypher o to the flowing quantity whoſe moment or increment it is; thus, xo the moment of x. In the doctrine of Increments, by Dr Brooke Taylor and Mr Emerſon, they are denoted by points below the variable quantities; as $\underset{.}{x}$. Some have alſo denoted them by accents underneath the letter, as $\underset{\prime}{x}$; but it is now more uſual to expreſs them by accents over the ſame letter; as $\overset{\prime}{x}$.

Method of INCREMENTS, a branch of Analytics, in which a calculus is founded on the properties of the ſucceſſive values of variable quantities, and their differences or increments.

The inventor of the method of increments was the learned Dr Taylor, who, in the year 1715, publiſhed a treatiſe upon it; and afterwards gave ſome farther account and explication of it in the Philoſ. Tranſ. as applied to the finding of the ſums of ſeries. And another ingenious and eaſy treatiſe on the ſame, was publiſhed by Mr Emerſon, in the year 1763. The method is nearly allied to Newton's Doctrine of Fluxions, and ariſes out of it. Alſo the Differential method of Mr Stirling, which he applies to the ſummation and interpolation of ſeries, is of the ſame nature as the method of increments, but not ſo general and extenſive.

INDEPENDENCE, MOUNT, is ſituated on the ſtrait through which the waters of Lake George and Eaſt Bay flow into Lake Champlain, in the N. W. part of the town of Orwell in Rutland county, Vermont, and oppoſite to Ticonderoga.—*Morſe.*

INDETERMINATE Problem. See Algebra, Part I. Chap. VI. *Encycl.*

Diophantus was the firſt writer on indeterminate problems, which, after the publication of his work in 1621 by Bachet, employed much of the time of the moſt celebrated mathematicians in Europe. Afterwards ſuch problems were neglected as uſeleſs, till the public attention was again drawn to them by Euler and la Grange. The example of ſuch men was followed by Mr John Leſlie, a very eminent and ſelf-taught mathematician; who, in the ſecond vol. of the Tranſactions of the Royal Society of Edinburgh, has publiſhed an ingenious paper on indeterminate problems, reſolving them by a new and general principle. "The doctrine of indeterminate equations (ſays Mr Leſlie) has been ſeldom treated in a form equally ſyſtematic with the other parts of algebra. The ſolutions commonly given are devoid of uniformity, and often require a variety of aſſumptions. The object of this paper is to reſolve the complicated expreſſions which we obtain in the ſolution of indeterminate problems, into ſimple equations, and to do ſo, without framing a number of aſſumptions, by help of a ſingle principle, which, though extremely ſimple, admits of a very extenſive application.

"Let A × B be any compound quantity equal to another, C × D, and let m be any rational number aſſumed at pleaſure; it is manifeſt that, taking equimultiples, $A \times m B = C \times m D$. If, therefore, we ſuppoſe that $A = mD$, it muſt follow that $mB = C$, or $B = \frac{C}{m}$. Thus two equations of a lower dimenſion are obtained. If theſe be capable of farther decompoſition, we may aſſume the multiples n and p, and form four equations ſtill more ſimple. By the repeated application of this principle, an higher equation, admitting of diviſors, will be reſolved into thoſe of the firſt order, the number of which will be one greater than that of the multiples aſſumed."

For example, reſuming the problem at firſt given, viz. to find two rational numbers, the difference of the ſquares of which ſhall be a given number. Let the given number be the product of a and b; then by hypotheſis, $x^2 - y^2 = ab$; but theſe compound quantities admit of an eaſy reſolution, for $\overline{x + y} \times \overline{x - y} = a \times b$. If, therefore, we ſuppoſe $x + y = ma$, we ſhall obtain $x - y = \frac{b}{m}$; where m is arbitrary, and if rational, x and y muſt alſo be rational. Hence the reſolution of theſe two equations gives the values of x and y, the numbers ſought, in terms of m; viz. $x = \frac{m^2 a + b}{2m}$, and $y = \frac{m^2 a - b}{2m}$.

INDIAN OLD TOWN, a town in Lincoln county, in the Diſtrict of Maine, ſituated on an iſland in Penobſcot river, juſt above the Great Falls, and about 60 below the Forks. Here are about 100 families, who are Roman Catholics, the remains of the Penobſcot tribe, and the only Indians who reſide in the Diſtrict of Maine. They live together in a regular ſociety, and are increaſing in number; the Sachems having laid an injunction on the young people to marry early. In a former war, this tribe had their lands taken from them; but at the commencement of the American revolution, the Provincial Congreſs granted them a tract of land, 12 miles wide, interſected in the middle by the river. They have a right, in preference to any other tribe, to hunt and fiſh as far as the mouth of the bay of Penobſcot extends. In their town is a decent church with a bell; and a prieſt reſides among them to adminiſter the ordinances.—*Morse.*

INDIAN ORCHARD, a tract of land in Northampton county, Pennſylvania, on the W. ſide of Delaware river, on the river Lexawacſein.—*ib.*

INDIANA, a territory in Virginia, lying between Ohio river and the Laurel Mountain, containing about 3½ millions of acres. It is nearly of a triangular form, and extends in length from the Pennſylvania line to the waters of the Little Kanhaway. It was granted to Samuel Wharton, William Trent, and George Morgan, eſquires, and a few other perſons, in the year 1768, by the Shawaneſe, Delaware and Huron tribes of Indians, as a compenſation for loſſes to the amount of £85,916 : 10 : 8 currency, which theſe people had ſuſtained by the depredations of the Indians, in the year 1763. It is a valuable tract of land; but the title of the proprietors, though pronounced good by a Committee of Congreſs in 1782, is at preſent embarraſſed in conſequence of the revolution.—*ib.*

INDIAN RIVER, or *Cypreſs Swamp*, lies partly in the States of Maryland and Delaware. This moraſs extends 6 miles from eaſt to weſt, and nearly 12 from north to ſouth, including an area of nearly 50,000 acres of land. The whole of this ſwamp is a high and level baſon, very wet, though undoubtedly the higheſt land on that part of the coaſt. Falſe Cape, at the mouth of Indian river, and the N. E. part of Cedar Neck is in 38° 35′ 15″ N. lat. and 11½ miles ſouth of the lighthouſe at Cape Henlopen. Cedar Swamp contains a great variety of plants, trees, wild beaſts, birds, and reptiles.—*ib.*

INDIAN RIVER, on the eaſt coaſt of the peninſula of E. Florida, riſes a ſhort diſtance from the ſea-coaſt, and runs from north to ſouth, forming a kind of inland paſſage for many miles along the coaſt. It is alſo called Rio Ays, and has on the north ſide of its mouth the point El Palmar, on the ſouth that of the Leech. N. lat. 27° 30′, W. long. 80° 40′.—*ib.*

INDIANS. The amount of Indian population, in America, can only be gueſſed at. The new diſcovered iſlands in the South Sea, and part of the N. W. coaſt are probably the moſt populous. The beſt informed have conjectured the number of aboriginal inhabitants, or Indians, in America, to be under two millions and a half. The decreaſe ſince the diſcovery of America, has been amazing: At that period, the iſland of Hiſpaniola alone contained at leaſt a million of inhabitants; Bartholomew de las Caſas eſtimated the number at three millions. Millions were buried in the mines or hunted to death by the Spaniards, both on the iſlands and continent. In the northern parts of America, numbers were doubtleſs deſtroyed in forming the Engliſh, Dutch, and French colonies; but notwithſtanding the ruptures between the coloniſts and the Indians, very few comparatively periſhed by war. Famine, and its companion the peſtilence, frequently deſtroy whole tribes. The diſeaſes alſo introduced by the Europeans, have made great havock; the ſpirituous liquors in the uſe of which they have been initiated by the whites, prove perhaps moſt of all repugnant to population. They waſte as the Europeans advance; they moulder away, and diſappear. The moſt numerous tribes are at the greateſt diſtance from the ſettlements of the whites, and it is very certain that in proportion to their diſtance they are unacquainted with the uſe of fire-arms. All the nations north of lake Superior, and thoſe beyond the Miſſiſſippi, uſe only bows and arrows, ſo that when their ſcattered ſituation is conſidered, the various cuſtoms and ſuperſtitions which it would be neceſſary to reconcile, in order to produce unity of action, and what a ſmall proportion of them have the apparatus, or underſtand the uſe of muſquetry, or poſſeſs reſources to enable them to carry on laſting hoſtilities againſt the power of the United States, it muſt be obvious that even partial defeats of the federal troops will haſten their ruin, notwithſtanding the wonderful dexterity and intrepidity which they exhibited in ſeveral actions with the regular troops in the late war. But this neither is nor ought to be the wiſh of the inhabitants of the United States; they ought to teach them the bleſſings of peace, and curb the exorbitant luſt of farther extent of territory.

A liſt of Indian tribes, in Imlay's Hiſtory of Kentucky, makes the aggregate number leſs than 60,000 who inhabit the country from the gulf of Mexico on both ſides of the Miſſiſſippi, to the gulf of St Lawrence, and as far weſt as the country has been generally explored, that is, to the head water of the Miſſiſſippi, and from thence a good way up the Miſſouri, and between that river and Santa Fe. To give any account of the nations farther ſouth, far leſs in S. America, would be a taſk beyond all bounds; the chief of theſe are noticed under their reſpective names.

The population of the Indian nations in the ſouthern parts of the United States, ſomewhat different from Imlay, is, according to Mr Purcell, who reſided among them in 1780, as follows:

	Gun-men.	Total.
Muſcogees, commonly-ly called Creeks	5,860	17,280
Chactaws	4,131	13,423
Chickaſaws	575	2,290
Cherokees	2,800	8,550
Catabaws	150	490
	13,516	42,033

The above red nations have increaſed in a ſmall degree ſince the general peace eſtabliſhed among them in 1777. The whites incorporated among them are few in number, and lead a vagabond life, going from tribe to tribe as their reſtleſs diſpoſition leads them. The increaſe of population is conſiderably checked by the quantities of adulterated and poiſonous ſpirituous liquors, and the venereal diſtemper introduced among them by the whites.

Major Gen. Anthony Wayne put an end to the deſtructive war with the Indians by a treaty of peace and friendſhip concluded at Greenville Aug. 3, 1795, which was ratified by the Preſident of the United States, Dec. 22, 1795. The Indian tribes ſigned the treaty in the following order: *Wyandots*, *Delawares*, *Shawanoes*, *Ottawas*, *Chipawas*, *Ottawa*, *Patawatames* of the river of St Joſeph, *Patawatames* of Huron, *Miamis*, *Miamis* and *Eel River*, *Eel River* tribe, *Miamis*, *Kickapoos* and *Kaſkaſkias*, *Delawares* of Sanduſky, and ſome of the *Six Nations* living at Sanduſky. Theſe Indians ceded to the United States various tracts of land from 2 to 12 miles ſquare, near the different poſts in the N. W. Territory. The United States delivered to the Indian tribes above named in goods to the value of 20,000 dollars; and agreed to deliver in goods to the value of 9,500 dollars annually, forever. The portion which each tribe is to receive will be ſeen in the account of the particular nation or tribe.

Little is yet known of the Indians in the interior parts of North-America. In 1792, Mr Stewart, ſaid to be in the employ of the Britiſh court, returned from four years travels through the hitherto unexplored regions to the weſtward. Taking his courſe weſt-ſouth-weſterly from the poſts on the lakes, he penetrated to the head of the Miſſouri, and from thence due W. to within 500 miles of the ſhores of the Pacific ocean. He joined the interior Indians in ſeveral battles againſt the ſhore Indians, all which coming ſhort of his object, the procuring a peace, ſo that he might explore the continent from ſea to ſea; after ſome ſtay, he returned nearly by the ſame route he had purſued in going out. Beyond the Miſſouri, Mr Stewart met with many powerful nations, in general hoſpitable and courteous. The Indian nations he viſited weſtward, appeared to be a poliſhed and civilized people, having towns regularly built, and being in a ſtate of ſociety not far removed from that of the Europeans, and only wanting the uſe of iron and ſteel to be perfectly ſo. They are always clad in ſkins, cut in an elegant manner, and in many reſpects preferable to the garments in uſe among the whites. Adjacent to theſe nations is a vaſt ridge of mountains, which may be called the Alleghany of the weſtern parts of America, and ſerves as a barrier againſt the two frequent incurſions of the coaſt Indians, who entertain a mortal antipathy to the nations and tribes inhabiting the country eaſtward of the mountains.—*ib.*

Indian-Town, in Maryland, a village ſituated on Indian Creek, on the S. E. bank of Choptank river, and in Dorcheſter county, 3 miles S. W. of New-Market.—*ib.*

Indian-Town, a ſmall poſt-town of N. Carolina, 10 miles from Sawyer's Ferry, and 52 from Edenton.—*ib.*

INDUCTION, in logic, is that proceſs of the underſtanding by which, from a number of *particular* truths perceived by ſimple apprehenſion, and diligently compared together, we infer another truth which is always *general* and ſometimes *univerſal*. It is perhaps needleſs to obſerve, that in the proceſs of induction the truths to be compared muſt be of the ſame kind, or relate to objects having a ſimilar nature; for the mereſt tyro in ſcience knows that phyſical truths cannot be compared with moral truths, nor the truths of pure mathematics with either.

That the method of induction is a juſt logic, has been ſufficiently evinced elſewhere (ſee Logic, Part III. chap. V. and Philosophy, n° 73—78. *Encycl.*), and is now indeed generally admitted. It is even admitted by Britiſh philoſophers to be the only method of reaſoning by which any progreſs can be made in the phyſical ſciences; for the laws of Nature can be diſcovered only by accurate experiments, and by carefully noting the agreements and the differences, however minute, which are thus found among the phenomena apparently ſimilar. It is not, however, commonly ſaid that *induction* is the method of reaſoning employed by the mathematicians; and the writer of this article long thought, with others, that in pure geometry the reaſoning is ſtrictly *ſyllogiſtical*. Mature reflection, however, has led him to doubt, with Doctor Reid,* the truth of the generally received opinion, to doubt even whether by categorical ſyllogiſms any thing whatever can be proved.

To the idolaters of Ariſtotle we are perfectly aware that this will appear an extravagant paradox; but to the votaries of truth, we do not deſpair of making it very evident, that for ſuch doubts there is ſome foundation.

We are led into this diſquiſition to counteract, in ſome degree, what we think the pernicious tendency of the philoſophy of Kant, which attempts have been lately made to introduce into this country. Of this philoſophy we ſhall endeavour to give ſomething like a diſtinct view in the proper place. It is ſufficient to obſerve here, that it reſts upon the hypotheſis, that "we are in poſſeſſion of certain notions *à priori*, which are abſolutely *independent of all experience*, although the *objects of experience* correſpond with them; and which are diſtinguiſhed by *neceſſity* and ſtrict *univerſality*." Theſe innate

and

* Appendix to Vol. III. of *Sketches of the Hiſtory of Man.*

and univerſal notions, Kant conſiders as a ſet of *categories*, from which is to be deduced all ſuch knowledge as deſerves the name of ſcience; and he talks, of courſe, or at leaſt his Engliſh tranſlators repreſent him talking, with great contempt, of inductive reaſoning, and ſubſtituting ſyllogiſtic demonſtration in its ſtead.

As his categories are not familiar to our readers, we ſhall, in this place, examine ſyllogiſms connected with the categories of Ariſtotle, which are at leaſt more intelligible than thoſe of Kant, and which, being likewiſe general notions, muſt, in argument, be managed in the ſame way. Now the fundamental axiom upon which every categorical ſyllogiſm reſts, is the well known propoſition, which affirms, that "whatever may be predicated of a whole *genus*, may be predicated of every *ſpecies* and of every *individual* comprehended under that genus." This is indeed an undoubted truth; but it cannot conſtitute a foundation for reaſoning from the *genus* to the *ſpecies* or the *individual;* becauſe we cannot poſſibly know what can be predicated of the *genus* till we know what can be predicated of all the *individuals* ranged under it. Indeed it is only by aſcertaining, through the medium of induction, what can be predicated, and what not, of a number of individuals, that we come to form ſuch notions as thoſe of *genera* and *ſpecies;* and therefore, in a ſyllogiſm ſtrictly categorical, the propoſitions, which conſtitute the *premiſes*, and are taken for granted, are thoſe alone which are capable of proof; whilſt the concluſion, which the logician pretends to demonſtrate, muſt be evident to intuition or experience, otherwiſe the premiſes could not be known to be true. The analyſis of a few ſyllogiſms will make this apparent to every reader.

Dr Wallis, who, to an intimate acquaintance with the Ariſtotelian logic, added much mathematical and phyſical knowledge, gives the following ſyllogiſm as a perfect example of this mode of reaſoning in the firſt figure, to which it is known that all the other figures may be reduced:—

> *Omne animal* eſt *ſenſu præditum.*
> *Socrates* eſt *animal.* Ergo
> *Socrates* eſt *ſenſu præditus.*

Here the propoſition to be demonſtrated is, that Socrates is endowed with ſenſe; and the propoſitions aſſumed as ſelf-evident truths, upon which the demonſtration is to be built, are, that "every animal is endowed with ſenſe;" and that "Socrates is an animal." But how comes the demonſtrator to know that "every animal is endowed with ſenſe?" To this queſtion we are not aware of any anſwer which can be given, except this, that mankind have agreed to call every being, which they perceive to be endowed with ſenſe, an *animal*. Let this, then, be ſuppoſed the true anſwer: the next queſtion to be put to the demonſtrator is, How he comes to know that *Socrates* is an *animal?* If we have anſwered the former queſtion properly, or, in other words, if it be eſſential to this genus of beings to be endowed with ſenſe, it is obvious that he can know that Socrates is an *animal* only by perceiving him to be *endowed with ſenſe;* and therefore, in this ſyllogiſm, the propoſition to be proved is the very firſt of the three of which the truth is perceived; and it is perceived intuitively, and not inferred from others by a proceſs of reaſoning.

Though there are ten categories and five predicables, there are but two kinds of categorical propoſitions, viz. Thoſe in which the property or accident is predicated of the ſubſtance to which it belongs, and thoſe in which the *genus* is predicated of the *ſpecies* or *individual*. Of the former kind is the propoſition pretended to be proved by the ſyllogiſm which we have conſidered; of the latter, is that which is proved by the following:

> Quicquid ſenſu præditum, eſt animal,
> Socrates eſt ſenſu præditus. Ergo
> Socrates eſt animal.

That this is a categorical ſyllogiſm, legitimate in mode and figure, will be denied by no man who is not an abſolute ſtranger to the very firſt principles of the Ariſtotelian logic; but it requires little attention indeed to perceive that it proves nothing. The impoſition of names is a thing ſo perfectly arbitrary, that the being, or claſs of beings, which in Latin and Engliſh is called *animal*, is with equal propriety in Greek called ζωον, and in Hebrew נפש. To a native of Greece, therefore, and to an ancient Hebrew, the major propoſition of this ſyllogiſm would have been wholly unintelligible; but had either of thoſe perſons been told by a man of known veracity, and acquainted with the Latin tongue, that every thing endowed with ſenſe was, by the Romans, called *animal*, he would then have underſtood the propoſition, admitted its truth without heſitation, and have henceforth known that Socrates and Moſes, and every thing elſe which he perceived to be endowed with ſenſe, would at Rome be called *animal*. This knowledge, however, would not have reſted upon demonſtrative reaſoning of any kind, but upon the credibility of his informer, and the intuitive evidence of his own ſenſes.

It will perhaps be ſaid, that the two ſyllogiſms which we have examined are improper examples, becauſe the truth to be proved by the former is ſelf-evident, whilſt that which is meant to be eſtabliſhed by the latter is merely verbal, and therefore arbitrary. But the following is liable to neither of theſe objections:

> *All animals* are *mortal.*
> *Man* is *an animal;* therefore
> *Man* is *mortal.*

Here it would be proper to aſk the demonſtrator, upon what grounds he ſo confidently pronounces all animals to be mortal? The propoſition is ſo far from expreſſing a ſelf-evident truth, that, previous to the entrance of ſin and death into the world, the firſt man had ſurely no conception of mortality. He acquired the notion, however, by experience, when he ſaw the animals die in ſucceſſion around him; and when he obſerved that no animal with which he was acquainted, not even his own ſon, eſcaped death, he would conclude that all animals, without exception, are mortal. This concluſion, however, could not be built upon ſyllogiſtic reaſoning, nor yet upon intuition, but partly upon experience and partly on analogy. As far as his experience went, the proof, by induction, of the mortality of all animals was complete; but there are many animals in the ocean, and perhaps on the earth, which he never ſaw, and of whoſe mortality therefore he could affirm nothing but from analogy, *i. e.* from concluding, as the conſtitution of the human mind compels us to conclude, that Nature is uniform throughout the univerſe, and that ſimilar cauſes, whether known or unknown, will, in ſimilar circumſtances, produce, at all times, ſimilar effects. It is to be obſerved of this ſyllogiſm, as of the firſt which we have conſidered, that the propoſition, which it pretends to demonſtrate, is one of thoſe truths known by experience, from which, by the proceſs of induction, we infer the major of the premiſes to be true; and that therefore the reaſoning, if reaſoning it can be called, runs in a circle.

Yet by a concatenation of ſyllogiſms have logicians pretended that a long ſeries of important truths may be diſcovered and demonſtrated; and even Wallis himſelf ſeems to think, that this is the inſtrument by which the mathematicians have deduced, from a few poſtulates, accurate definitions, and undeniable axioms, all the truths of their demonſtrative ſcience. Let us try the truth of this opinion by analyſing ſome of Euclid's demonſtrations.

In the ſhort article Principle *(Encycl.)*, it has been ſhewn, that all our *firſt* truths are *particular*, and that it is by applying to them the rules of induction that we form general truths or axioms—even the axioms of pure geometry. As this ſcience treats not of real external things, but merely of *ideas* or *conceptions*, the creatures of our minds, it is obvious, that its definitions may be perfectly accurate, the induction by which its axioms are formed complete, and therefore the axioms themſelves *univerſal* propoſitions. The uſe of theſe axioms is merely to ſhorten the different proceſſes of geometrical reaſoning, and not, as has ſometimes been abſurdly ſuppoſed, to be made the *parents* or *cauſes* of *particular* truths. No truth, whether general or particular, can, in any ſenſe of the word, be the cauſe of another truth. If it were not true that all individual figures, of whatever form, comprehending a portion of ſpace equal to a portion comprehended by any other individual figure, whether of the ſame form with ſome of them, or of a form different from them all, are equal to one another, it would not be true that "things in *general*, which are equal to the ſame thing, or that magnitudes which coincide, or exactly fill the ſame ſpace," are reſpectively equal to one another; and therefore the firſt and eighth of Euclid's axioms would be falſe. So far are theſe axioms, or general truths, from being the parents of particular truths, that, as conceived by us, they may, with greater propriety, be termed their *offſpring*. They are indeed nothing more than general expreſſions, comprehending all particular truths of the ſame kind. When a mathematical propoſition therefore is enounced, if the terms, of which it is compoſed, or the figures of which a certain relation is predicated, can be brought together and immediately compared, no demonſtration is neceſſary to point out its truth or falſehood. It is indeed intuitively perceived to be either comprehended under, or contrary to ſome known *axiom* of the ſcience; but it has the evidence of truth or falſehood in itſelf and not in *conſequence* of that axiom. When the figures or ſymbols cannot be immediately compared together, it is then, and only then, that recourſe is had to demonſtration; which proceeds, not in a ſeries of ſyllogiſms, but by a proceſs of ideal menſuration or induction. A figure or ſymbol is conceived, which may be compared with each of the principal figures or ſymbols, or, if that cannot be, with one of them, and then another, which may be compared with it, till through a ſeries of well known intermediate relations, a compariſon is made between the terms of the original propoſition, of which the truth or falſehood is then perceived.

Thus in the 47th propoſition of the firſt book of Euclid's Elements, the author propoſes to demonſtrate the equality between the ſquare of the hypothenuſe of a right angled triangle, and the ſum of the ſquares deſcribed on the other two ſides; but he does not proceed in the way of categorical ſyllogiſms, by raiſing his demonſtration on ſome univerſal truth relating to the *genus* of *ſquares*. On the contrary, he proceeds to *meaſure* the three ſquares of which he has affirmed a certain relation; but as they cannot be immediately compared together, he directs the largeſt of them to be divided into two parallelograms, according to a rule which he had formerly aſcertained to be juſt; and as theſe parallelograms can, as little as the ſquare of which they are the conſtituent parts, be compared with the ſquares of the other two ſides of the triangle, he thinks of ſome intermediate figure which may be applied as a common meaſure to the ſquares and the parallelograms. Accordingly, having before found that a parallelogram, or ſquare, is exactly double of a triangle ſtanding on the ſame baſe and between the ſame parallels with it, he conſtructs triangles upon the ſame baſe, and between the ſame parallels with his parallelograms, and the ſquares of the ſides containing the right angle of the original triangle; and finding, by a proceſs formerly ſhewn to be juſt, that the triangles on the baſes of the parallelograms are preciſely equal to the triangles on the baſes of the ſquares, he perceives at once that the two parallelograms, of which the largeſt ſquare is compoſed, muſt be equal to the ſum of the two leſſer ſquares; and the truth of the propoſition is demonſtrated.

In the courſe of this demonſtration, there is not ſo much as one truth *inferred* from another by *ſyllogiſm*, but all are perceived in ſucceſſion by a ſeries of ſimple apprehenſions. Euclid, indeed, after finding the triangle conſtructed on the baſe of one of the parallelograms to be equal to the triangle conſtructed on the baſe of one of the ſquares, introduces an *axiom*, and ſays, "but the doubles of equals are equal to one another; *therefore* the parallelogram is equal to the ſquare." But if from this mode of expreſſion any man conceive the axiom or univerſal truth to be the *cauſe* of the truth more particular, or ſuppoſe that the *latter* could not be apprehended without a *previous* knowledge of the former, he is a ſtranger to the nature of evidence, and to the proceſs of *generalization*, by which axioms are formed.

If we examine the problems of this ancient geometrician, we ſhall find that the truth of them is proved by the very ſame means which he makes uſe of to point out the truth of his theorems. Thus, the firſt problem of his immortal work is, "to deſcribe an equilateral triangle on a given finite ſtraight line;" and not only is this to be done, but the method by which it is done muſt be ſuch as can be ſhewn to be incontrovertibly juſt. The ſides of a triangle, however, cannot be applied to each other ſo as to be immediately compared; for they are conceived to be immoveable among themſelves. A common meaſure, therefore, or ſomething equivalent to a common meaſure, muſt be found, by which the triangle may be conſtructed, and the equa-

Induction.

lity of its three ſides afterwards evinced; and this equivalent Euclid finds in the *circle*.

By contemplating the properties of the circle, it was eaſy to perceive that all its *radii* muſt be equal to one another. He therefore directs two circles to be deſcribed from the oppoſite extremities of the given finite ſtraight line, ſo as that it may be the radius of each of them; and from the point in which the circles interſect one another, he orders lines to be drawn to the extreme points of the given line, affirming that theſe three lines conſtitute an equilateral triangle. To convince his reader of the truth of this affirmation, he has only to put him in mind, that from the properties of the circle, the lines which he has drawn muſt be each equal to the given line, and of courſe all the three equal to one another; and this mutual equality is perceived by ſimple apprehenſion, and not inferred by ſyllogiſtic reaſoning. Euclid, indeed, by introducing into the demonſtration his firſt axiom, gives to it the form of a ſyllogiſm: but that ſyllogiſm proves nothing; for if the equality of the three ſides of the triangle were not intuitively perceived in their poſition and the properties of the circle, the firſt axiom would itſelf be a falſehood. So true it is that categorical ſyllogiſms have no place in geometrical reaſoning; which is as ſtrictly experimental and inductive as the reaſoning employed in the various branches of phyſics.

But if this be ſo, how come the truths of pure geometry to be neceſſary, ſo that the contrary of any one of them is clearly perceived to be impoſſible; whilſt phyſical truths are all contingent, ſo that there is not one of them of which the direct contrary may not eaſily be conceived?

That there is not one phyſical truth, of which the contrary may not be conceived, is not perhaps ſo certain as has generally been imagined; but admitting the fact to be as it has commonly been ſtated, the apparent difference between this claſs of truths and thoſe of pure geometry, may be eaſily accounted for, without ſuppoſing that the former reſts upon a kind of evidence totally different from that which ſupports the fabric of the latter.

The objects of pure geometry, as we have already obſerved, are the creatures of our own minds, which contain in them nothing concealed from our view. As the mathematician treats them merely as meaſurable quantities, he knows, with the utmoſt preciſion, upon what particular properties the relation affirmed to ſubſiſt between any two or more of them muſt abſolutely depend; and he cannot poſſibly entertain a doubt but it will be found to have place among all quantities having the ſame properties, becauſe it depends upon them, and upon them alone. His proceſs of induction, therefore, by a ſeries of ideal meaſurements, is always complete, and exhauſts the ſubject; but in phyſical enquiries the caſe is widely different. The ſubjects which employ the phyſical enquirer are not his own ideas, and their various relations, but the properties, powers, and relations of the bodies which compoſe the univerſe; and of thoſe bodies he knows neither the ſubſtance, internal ſtructure, nor all the qualities: ſo that he can very ſeldom diſcover with certainty upon what particular property or properties the phenomena of the corporeal world, or the relations which ſubſiſt among different bodies, depend. He expects, indeed, with confidence, not inferior to that with which he admits a mathematical demonſtration, that any corporeal phenomenon, which he has obſerved in certain circumſtances, will be always obſerved in circumſtances exactly ſimilar; but the misfortune is, that he can very ſeldom be aſcertained of this ſimilarity. He does not know any one piece of matter *as it is in itſelf*; he cannot ſeparate its various properties; and of courſe cannot attribute to any one property the effects or apparent effects which proceed excluſively from it. Indeed, the properties of bodies are ſo cloſely interwoven, that by human means they cannot be completely ſeparated; and hence the moſt cautious inveſtigator is apt to attribute to ſome one or two properties, an event which in reality reſults perhaps from many. (See Philosophy and Physics, *Encycl.*). This the geometrician never does. He knows perfectly that the relation of equality which ſubſiſts between the three angles of a plain triangle and two right angles, depends not upon the ſize of the triangles, the matter of which they are conceived to be made, the particular place which they occupy in the univerſe, or upon any one circumſtance whatever beſides their triangularity, and the angles of their corrolets being exactly right angles; and it is upon this power of diſcrimination which we have in the conceptions of pure geometry, and have not in the objects of phyſics, that the truths of the one ſcience are perceived to be neceſſary, while thoſe of the other appear to be contingent; though the mode of demonſtration is the ſame in both, or at leaſt equally removed from categorical ſyllogiſms.

Induction, || Inflammation.

INERTIA. See Dynamics and Impulsion in this *Supplement*.

INFLAMMATION has been ſufficiently explained in the *Encyclopædia*, and in the article Chemistry in this *Supplement*; but it cannot be improper, in this place, to give an account of ſome remarkable

Spontaneous Inflammations, which, as different ſubſtances are liable to them, have been, and may again be, the cauſe of many and great misfortunes.

The ſpontaneous inflammation of eſſential oils, and that of ſome fat oils, when mixed with nitrous acid, are well known to philoſophers: ſo alſo is that of powdered charcoal with the ſame acid (lately diſcovered by M. Prouſt), and thoſe of phoſphorus, of pyrophorus, and of fulminating gold. Theſe ſubſtances are generally to be found only in the laboratories of chemiſts, who are perfectly well acquainted with the precautions which it is neceſſary to take to prevent the unhappy accidents which may be occaſioned by them.

The burning of a ſtore-houſe of ſails, which happened at Breſt in the year 1757, was cauſed by the ſpontaneous inflammation of ſome oiled cloths, which, after having been painted on one ſide, and dried in the ſun, were ſtowed away while yet warm; as was ſhewn by ſubſequent experiments.*

Vegetables boiled in oil or fat, and left to themſelves, after having been preſſed, inflame in the open air. This inflammation always takes place when the vegetables retain a certain degree of humidity; if they are firſt thoroughly dried, they are reduced to aſhes, without the appearance of flame. We owe the obſervation of theſe facts to MM. Saladin and Carette.†

The heaps of linen rags which are thrown together in paper manufactories, the preparation of which is haſtened by means of fermentation, often take fire, if not carefully attended to.

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* See *Memoires de l'Academie de Paris*, 1760.

† *Journal de Phyſique*, 1784.

The ſpontaneous inflammation of hay has been known for many centuries; by its means houſes, barns, &c. have been often reduced to aſhes. When the hay is laid up damp, the inflammation often happens; for the fermentation is then very great. This accident very ſeldom occurs to the firſt hay (according to the obſervation of M. de Bomare), but is much more common to the ſecond; and if, through inattention, a piece of iron ſhould be left in a ſtack of hay in fermentation, the inflammation of that ſtack is almoſt a certain conſequence. Corn heaped up has alſo ſometimes produced inflammations of this nature. Vanieri, in his *Prædium Ruſticum*, ſays,

> *Quæ vero (gramina) nondum ſatis inſolata recondens*
> *Imprudens, ſubitis pariunt incendia flammis.*

Dung alſo, under certain circumſtances, inflames ſpontaneouſly.

In a paper, publiſhed in the *Repertory of Arts and Manufactures*, by the Rev. William Tooke, F. R. S. &c. we have the following remarkable inſtances of ſpontaneous inflammation. "A perſon of the name of Rüde, an apothecary at Bautzen, had prepared a pyrophorus from rye-bran and alum. Not long after he had made the diſcovery, there broke out, in the next village of Nauſlitz, a great fire, which did much miſchief, and was ſaid to have been occaſioned by the treating of a ſick cow in the cow-houſe. Mr Rüde knew, that the countrymen were uſed to lay an application of parched rye-bran to their cattle for curing the thick neck; he knew alſo, that alum and rye-bran, by a proper proceſs, yielded a pyrophorus; and now he wiſhed to try whether parched rye-bran alone would have the ſame effect. Accordingly, he roaſted a quantity of rye-bran by the fire, till it had acquired the colour of roaſted coffee. This roaſted bran he wrapped up in a linen cloth; in the ſpace of a few minutes there aroſe a ſtrong ſmoke through the cloth, accompanied by a ſmell of burning. Not long afterwards the rag grew as black as tinder, and the bran, now become hot, fell through it on the ground in little balls. Mr Rüde repeated the experiment at various times, and always with the ſame reſult. Who now will any longer doubt, that the frequency of fires in cow-houſes, which in thoſe parts are moſtly wooden buildings, may not be occaſioned by this common practice, of binding roaſted bran about the necks of the cattle? The fire, after conſuming the cattle and the ſhed, communicates itſelf to the adjoining buildings; great damage enſues; and the ignorant look for the cauſe in wilful and malicious firing, conſequently in a capital crime."

The ſame author informs us, that in the ſpring of the year 1780, a fire was diſcovered on board a Ruſſian frigate lying in the road of Cronſtadt; which, if it had not been timely extinguiſhed, would have endangered the whole fleet. After the ſevereſt ſcrutiny, no cauſe of the fire was to be found; and the matter was forced to remain without explanation, but with ſtrong ſurmiſes of ſome wicked incendiary being at the bottom of it. In the month of Auguſt, in the ſame year, a fire broke out at the hemp-magazine at St Peterſburgh, by which ſeveral hundred thouſand poods[‡] of hemp and flax were conſumed. The walls of the magazine are of brick, the floors of ſtone, and the rafters and covering of iron; it ſtands alone on an iſland in the Neva, on which, as well as on board the ſhips lying in the Neva, no fire is permitted. In St Peterſburgh, in the ſame year, a fire was diſcovered in the vaulted ſhop of a furrier. In theſe ſhops, which are all vaults, neither fire nor candle is allowed, and the doors of them are all of iron. At length the probable cauſe was found to be, that the furrier, the evening before the fire, had got a roll of new cere-cloth (much in uſe here for covering tables, counters, &c. being eaſily wiped and kept clean), and had left it in his vault, where it was found almoſt conſumed.

In the night between the 20th and 21ſt of April 1781, a fire was ſeen on board the frigate Maria, which lay at anchor, with ſeveral other ſhips, in the road off the iſland of Cronſtadt; the fire was, however, ſoon extinguiſhed; and, by the ſevereſt examination, little or nothing could be extorted concerning the manner in which it had ariſen. The garriſon was threatened with a ſcrutiny that ſhould coſt them dear; and while they were in this cruel ſtate of ſuſpence, an order came from the ſovereign, which quieted their minds, and gave riſe to ſome very ſatisfactory experiments.

It having been found, upon juridical examination, as well as private inquiry, that in the ſhip's cabin, when the ſmoke appeared, there lay a bundle of matting, containing Ruſſian lamp-black prepared from fir-ſoot, moiſtened with hemp-oil varniſh, which was perceived to have ſparks of fire in it at the time of the extinction, the Ruſſian admiralty gave orders to make various experiments, in order to ſee whether a mixture of hemp-oil varniſh and the forementioned Ruſſian black, folded up in a mat and bound together, would kindle of itſelf.

They ſhook 40 pounds of fir-wood ſoot into a tub, and poured about 35 pounds of hemp-oil varniſh upon it; this they let ſtand for an hour, after which they poured off the oil. The remaining mixture they now wrapped up in a mat, and the bundle was laid cloſe to the cabin, where the midſhipmen had their birth. To avoid all ſuſpicion of treachery, two officers ſealed both the mat and the door with their own ſeals, and ſtationed a watch of four ſea officers, to take notice of all that paſſed the whole night through; and as ſoon as any ſmoke ſhould appear, immediately to give information to the commandant of the port.

The experiment was made the 26th of April, about 11 o'clock A. M. in preſence of all the officers named in the commiſſion. Early on the following day, about ſix o'clock A. M. a ſmoke appeared, of which the chief commandant was immediately informed by an officer: he came with all poſſible ſpeed, and through a ſmall hole in the door ſaw the mat ſmoking. Without opening the door, he diſpatched a meſſenger to the members of the commiſſion; but as the ſmoke became ſtronger, and fire began to appear, the chief commandant found it neceſſary, without waiting for the members of the commiſſion, to break the ſeals and open the door. No ſooner was the air thus admitted, than the mat began to burn with greater force, and preſently it burſt into a flame.

The Ruſſian admiralty, being now fully convinced of the ſelf-enkindling property of this compoſition, tranſmitted their experiment to the Imperial Academy

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[‡] A pood conſiſts of 40 pounds Ruſs. or 36 Engliſh.

of Sciences ; who appointed Mr Georgi, a very learned and able adjunct of the academy, to make farther experiments on the ſubject. Previous to the relation of theſe experiments, it is neceſſary to obſerve, that the Ruſſian fir-black is three or four times more heavy, thick, and unctuous, than that kind of painters black which the Germans call *kien-rahm*. The former is gathered at Ochta, near St Peterſburgh, at Moſco, at Archangel, and other places, in little wooden huts, from reſinous fir-wood, and the unctuous bark of birch, by means of an apparatus uncommonly ſimple, conſiſting of pots without bottoms ſet one upon the other ; and is ſold very cheap. The famous fine German *kien-rahm* is called in Ruſſia *Holland's black*. In what follows, when raw oil is ſpoken of, it is to be underſtood of linſeed-oil or hemp-oil ; but moſt commonly the latter. The varniſh is made of five pounds of hemp-oil boiled with two ounces and a half of minium. For wrapping up the compoſition, Mr Georgi made uſe of coarſe hemp-linen, and always ſingle, never double. The impregnations and commixtures were made in a large wooden bowl, in which they ſtood open till they were wrapped up in linen.

Three pounds of Ruſſian fir-black were ſlowly impregnated with five pounds of hemp-oil varniſh ; and when the mixture had ſtood open five hours, it was bound up in linen. By this proceſs it became clotted ; but ſome of the black remained dry. When the bundle had lain ſixteen hours in a cheſt, it was obſerved to emit a very nauſeous, and rather putrid, ſmell, not quite unlike that of boiling oil. Some parts of it became warm, and ſteamed much ; this ſteam was watery, and by no means inflammable. Eighteen hours after the mixture was wrapped up, one place became brown, emitted ſmoke, and directly afterwards glowing fire appeared. The ſame thing happened in a ſecond and a third place, though other places were ſcarcely warm. The fire crept ſlowly around, and gave a thick, grey, ſtinking ſmoke. Mr Georgi took the bundle out of the cheſt, and laid it on a ſtone pavement ; when, on being expoſed to the free air, there aroſe a ſlow burning flame, a ſpan high, with a ſtrong body of ſmoke. Not long afterwards there appeared, here and there, ſeveral chaps or clefts, as from a little volcano, the vapour iſſuing from which burſt into flame. On his breaking the lump, it burſt into a very violent flame, full three feet high, which ſoon grew leſs, and then went out. The ſmoking and glowing fire laſted for the ſpace of ſix hours ; and afterwards the remainder continued to glow without ſmoke for two hours longer. The grey earthy aſhes, when cold, weighed five ounces and a half.

In another experiment, perfectly ſimilar to the foregoing, as far as relates to the compoſition and quantities, the enkindling did not enſue till 41 hours after the impregnation : the heat kept increaſing for three hours, and then the accenſion followed. It is worthy of remark, that theſe experiments ſucceeded better on bright days than on ſuch as were rainy ; and the accenſion came on more rapidly.

In another experiment, three pounds of Ruſſian fir-black were ſlowly impregnated with three pounds of raw hemp-oil ; and the accenſion enſued after nine hours.

Three quarters of a pound of German *rahm* were ſlowly impregnated with a pound and a half of hemp-oil varniſh. The mixture remained 70 hours before it became hot and reeking ; it then gradually became hotter, and emitted a ſtrong exhalation ; the effluvia were moiſt, and not inflammable. The reaction laſted 36 hours, during which the heat was one while ſtronger, and then weaker, and at length quite ceaſed.

Stove or chimney ſoot, moſtly formed from birch-wood ſmoke, was mingled with the above-mentioned ſubſtances and tied up ; the compound remained cold and quiet.

Ruſſian fir-black, mixed with equal parts of oil of turpentine, and bound up, exhibited not the leaſt reaction or warmth.

Birch oil, mixed with equal parts of Ruſſian fir-black, and bound up, began to grow warm and to emit a volatile ſmell ; but the warmth ſoon went off again.

From the experiments of the admiralty and of Mr Georgi, we learn, not only the deciſive certainty of the ſelf-accenſion of ſoot and oil, when the two ſubſtances are mixed under certain circumſtances, but alſo the following particulars :

Of the various kinds of ſoot, or lamp-black, the experiments ſucceeded more frequently and ſurely with the coarſer, more unctuous, and heavier, like Ruſſian painters black, than with fine light German *rahm*, or with coarſe chimney-ſoot. In regard to oils, only thoſe experiments ſucceeded which were made with drying oils, either raw or boiled. The proportions of the ſoots to the oils were, in the ſucceſsful experiments, very various ; the mixture kindled with a tenth, a fifth, a third, with an equal, and likewiſe with a double, proportion of oil. In general, however, much more depends on the mode of mixture, and the manipulation, and, as Mr Georgi often obſerved, on the weather ; for in moiſt weather the bundles, after becoming warm, would frequently grow cold again.

The inſtances of ſpontaneous inflammation hitherto mentioned have been only of vegetable ſubſtances ; but we have examples of the ſame thing in the animal kingdom. Pieces of woollen cloth, which had not been ſcoured, took fire in a warehouſe. The ſame thing happened to ſome heaps of woollen yarn ; and ſome pieces of cloth took fire in the road, as they were going to the fuller. Theſe inflammations always take place where the matters heaped up preſerve a certain degree of humidity, which is neceſſary to excite a fermentation ; the heat reſulting from which, by drying the oil, leads them inſenſibly to a ſtate of ignition ; and the quality of the oil, being more or leſs deſiccative, very much contributes thereto.

The woollen ſtuff prepared at Sevennes, which bears the name of Emperor's ſtuff, has kindled of itſelf, and burnt to a coal. It is not unuſual for this to happen to woollen ſtuffs, when in hot ſummers they are laid in a heap in a room but little aired.

In June 1781, the ſame thing happened at a woolcomber's in a manufacturing town in Germany, where a heap of wool-combings, piled up in a cloſe warehouſe ſeldom aired, took fire of itſelf. This wool had been by little and little brought into the warehouſe ; and, for want of room, piled up very high, and trodden down, that more might be added to it. That this combed wool, to which, as is well known, rape-oil mixed with butter is uſed in the combing, burnt of itſelf, was ſworn by ſeveral witneſſes. One of them affirmed that, ten years before, a ſimilar fire happened among the flocks of wool at a clothier's, who had put them into a caſk, where they were rammed hard, for their eaſier conveyance. This wool burnt from within outwards, and became quite a coal; it was very certain that neither fire nor light had been uſed at the packing, conſequently the above fires aroſe from ſimilar cauſes. In like manner, very credible cloth-workers have certified, that, after they have bought wool that was become wet, and packed it cloſe in their warehouſe, this wool has burnt of itſelf; and very ſerious conſequences might have followed, if it had not been diſcovered in time.

Nay, there are inſtances, though they be but rare, of human bodies being conſumed by ſpontaneous inflammation. In the Philoſophical Tranſactions, and in the Memoirs of the Academies of Paris and Copenhagen, it is related that an Italian lady (the Counteſs Cornelia Bandi) was entirely reduced to aſhes, except her legs; that an Engliſh woman, called Grace Pitt, was almoſt entirely conſumed by a ſpontaneous inflammation of her viſcera; and, laſtly, that a prieſt of Bergamo was conſumed in the ſame manner. Theſe ſpontaneous inflammations have been attributed to the abuſe of ſpirituous liquors; but though the victims of intemperance are indeed very numerous, theſe certainly do not belong to that number.

The mineral kingdom alſo often affords inſtances of ſpontaneous inflammation. Pyrites heaped up, if wetted and expoſed to the air, take fire. Pitcoal alſo, laid in heaps, under certain circumſtances, inflames ſpontaneouſly. M. Duhamel has deſcribed two inflammations of this nature, which happened in the magazines of Breſt, in the years 1741 and 1757. Cuttings of iron, which had been left in water, and were afterwards expoſed to the open air, gave ſparks, and ſet fire to the neighbouring bodies. For this obſervation we are obliged to M. de Charpentier.

The cauſes of theſe phenomena the chemiſt will aſſign; but they are here recorded as a warning to tradeſmen and others. It is evident, from the facts which have been related, that ſpontaneous inflammations being very frequent, and their cauſes very various, too much attention and vigilance cannot be uſed to prevent their dreadful effects. And conſequently it is impoſſible to be too careful in watching over public magazines and ſtorehouſes, particularly thoſe belonging to the ordnance, or thoſe in which are kept hemp, cordage, lampblack, pitch, tar, oiled cloths, &c. which ſubſtances ought never to be left heaped up, particularly if they have any moiſture in them. In order to prevent any accident from them, it would be proper to examine them often, to take notice if any heat is to be obſerved in them, and, in that caſe, to apply a remedy immediately. Theſe examinations ſhould be made by day, it not being adviſable to carry a light into the magazines; for when the fermentation is ſufficiently advanced, the vapours which are diſengaged by it are in an inflammable ſtate, and the approach of a light might, by their means, ſet fire to the ſubſtances whence they proceed. Ignorance of the fore-mentioned circumſtances, and a culpable negligence of thoſe precautions which ought to be taken, have often cauſed more misfortunes and loſs than the moſt contriving malice: it is therefore of great importance that theſe facts ſhould be univerſally known, that public utility may reap from them every poſſible advantage.

INFORMED Stars, or Informes Stellæ, are ſuch ſtars as have not been reduced into any conſtellation; otherwiſe called Sporades.—There was a great number of this kind left by the ancient aſtronomers; but Hevelius, and ſome others of the moderns, have provided for the greater part of them, by making new conſtellations.

INGRAHAM, *Port*, on the weſtern ſide of Waſhington Iſland, on the N. W. coaſt of N. America, is divided into two parts by Young Frederick's Iſland. It is a fine harbour for wintering in, being near the ſea, and having deep water. N. lat. 53° 37′, W. long. 133° 18′.—*Morſe.*

Ingraham *Iſles*, in the South Pacific ocean, lie N. N. W. of the Marqueſas Iſlands, from 35 to 50 leagues diſtant, and are 7 in number, viz. *Ooboona*, or Waſhington; *Wooapoo*, or Adams; Lincoln; *Nooheeva*, or Federal; *Tatoo-e-tee*, or Franklin; Hancock, and Knox. The names in Italic are thoſe by which they are known to the natives. The others were given them by Captain Joſeph Ingraham, of Boſton in Maſſachuſetts, commander of the brigantine Hope of Boſton, who diſcovered them on the 19th of April, 1791, a day remarkable in the annals of America, the revolutionary war having commenced on that day in 1775, and the firſt diſcoveries made under the flag of the United States marked its 16th anniverſary. Theſe iſlands, lying between 8° 3′ and 9° 24′ S. lat. and between 140° 19′ and 141° 18′ W. long. from Greenwich, are moſtly inhabited, and appear to be generally variegated with hills and vallies, abounding with timber, and very pleaſant. *Nooheeva*, or Federal iſland, is repreſented by the natives to be the largeſt, moſt populous and productive of the whole; which, they ſay, are 10 in number. The people reſemble thoſe of the Marqueſas Iſlands; as do their canoes, which are carved at each end. Cotton of a ſuperior quality grows here. The natives were friendly. Before Ingraham's diſcovery was known, Captain Joſiah Roberts, of Boſton, ſailed in the ſhip Jefferſon for the N. W. Coaſt, and likewiſe diſcovered theſe iſlands. As theſe iſlands lie in that part of the Pacific Ocean, through which veſſels from Europe or America, bound to the N. W. Coaſt, muſt paſs, and are not far out of their uſual track, they may be viſited for refreſhment in caſe of need.—*ib.*

INIRCHIA RIVER, or *Caguela*, the name of Orinoco river, at its ſource in the mountains, weſtward, between New Granada and Peru, not far from the South Sea.—*ib.*

Sympathetic INK is an old invention. Among the methods by which Ovid teaches young women to deceive their guardians, when they write to their lovers, he mentions that of writing with new milk, and of making the writing legible by coal-duſt or ſoot.

Tuta quoque eſt, fal'itque oculos, e lacte recenti
Litera: carbonis pulvere tange, leges.

It is obvious, that any other colourleſs and glutinous juice, which will hold faſt the black powder ſtrewed over it, will anſwer the purpoſe as well as milk; and therefore Pliny recommends the milky juice of certain plants to be uſed.

There are ſeveral metallic ſolutions perfectly colourleſs, or, at leaſt, without any ſtrong tint, which being wrote with, the letters will not appear until the paper be waſhed over with another colourleſs ſolution, or expoſed to the vapour of it; but among all theſe there is none which excites more aſtoniſhment, or from which naturaliſts can draw more concluſions, than that which conſiſts of a ſolution of lead in vegetable acid, and which by the vapour of arſenical liver of ſulphur becomes black, even at a conſiderable diſtance. This ink, which may be uſed by conjurors, proves the ſubtlety of vapour, and the poroſity of bodies; as the change or colouring takes place even when the writing is placed on the other ſide of a thin wall.

We knew before, that a ſolution of lead, treated in this manner, would anſwer the purpoſe of a ſympathetic ink (ſee that article *Encycl.*); but we did not know, nor do we yet believe, that the ſulphuric vapours will act upon the writing through *a wall.* Such, however, is the affirmation of Profeſſor Beckmann, who gives an account of a ſtill more wonderful ink from Peter Borel. This author, in a book called *Hiſtoriarum et obſervationum medico-phyſic. centuriæ quatuor*, printed at Paris, firſt in 1653, and afterwards in 1657, gives a receipt for making this ink, which he calls *magnetic waters which act at a diſtance.* The receipt is as follows:

"Let quick-lime be quenched in common water, and while quenching, let ſome orpiment be added to it (this, however, ought to be done by placing warm aſhes under it for a whole day), and let the liquor be filtered, and preſerved in a glaſs bottle well corked. Then boil litharge of gold, well pounded, for half an hour with vinegar, in a braſs veſſel, and filter the whole through paper, and preſerve it alſo in a bottle cloſely corked. If you write any thing with this laſt water, with a clean pen, the writing will be inviſible when dry; but if it be waſhed over with the firſt water it will become inſtantly black. In this, however, there is nothing aſtoniſhing; but this is wonderful, that though ſheets of paper without number, and even a board, be placed between the inviſible writing and the ſecond liquid, it will have the ſame effect, and turn the writing black, penetrating the wood and paper without leaving any traces of its action, which is certainly ſurpriſing; but a fetid ſmell, occaſioned by the mutual action of the liquids, deters many from making the experiment. I am, however of opinion, that I could improve this ſecret by a more refined chemical preparation, ſo as that it ſhould perform its effect through a wall. This ſecret (ſays Borel) I received, in exchange for others, from J. Broſſon, a learned and ingenious apothecary of Montpelier."

For making a ſympathetic ink of the fifth claſs mentioned in the *Encyclopædia*, the following proceſs by M. Meyer may be worthy of the reader's notice. It was entered upon in conſequence of a receipt for roſe-coloured ſympathetic ink ſhewn to him by a traveller. In that receipt cobalt was the principal ingredient, and therefore the firſt object was to procure cobalt; but M. Meyer, being unwilling to ſacrifice pure pieces of cobalt of any conſiderable ſize, made choice of one, which was viſibly mixed with biſmuth, iron, and quartz. He endeavoured to ſeparate the biſmuth as much as poſſible, and alſo the arſenic, if it ſhould contain any, by bringing it ſlowly to a red heat and he ſucceeded pretty well, as the biſmuth flowed from it in abundance; and the arſenic, the quantity of which was ſmall, was volatiliſed: many globules of biſmuth ſtill adhered to it. By bringing it repeatedly to a red heat, and then quenching it in water, it was reduced to ſuch a ſtate as to be eaſily pulveriſed. Having poured nitrous acid upon the powder, he obtained by digeſtion a beautiful roſe-red ſolution; the ſiliceous earth was ſeparated in the form of a white ſlime, and by diluting it with water there was depoſited a white powder, which was oxyd of biſmuth. The ſolution being filtered, he added to it a ſolution of potaſh, and obtained a precipitate inclining more to a yellow than to a red colour. He again poured over it a little of the nitrous acid, by which a part of the oxyd was re-diſſolved of a red colour: the remaining part, which had a dark brown colour, was oxyd of iron. From the ſolution, by the addition of potaſh, a precipitate was formed, which was now reddiſh. Having by this proceſs obtained it pure, that he might now prepare from it the wiſhed for red ink, he diſſolved the waſhen pure oxyd of cobalt in different acids. That diſſolved in the nitrous acid with a mixture of nitre, gave a green ink like the common: that diſſolved in the ſulphurous acid, without the addition of ſalts, gave a reddiſh ink, which remained after it was expoſed to heat, and would not again diſappear, even when a ſolution of nitre was applied; and that diſſolved in the muriatic acid, gave a green ink, darker and more beautiful than the common. By diſſolving it, however, in the acetous acid, and adding a little nitre, he obtained what he had in view; for it gave, on the application of heat, an ink of a red colour, like that of the *roſa centifolia*, which again diſappeared when the paper became cold.

INNA-QUITO, one of the ſpacious plains upon the N. ſide of Quito, in Peru.—*Morſe.*

INORDINATE PROPORTION, is where the order of the terms compared is diſturbed or irregular. As, for example, in two ranks of numbers, three in each
rank, viz. in one rank, - - - - 2, 3, 9,
and in the other rank, - - - - 8, 24, 36,
which are proportional, the former to the latter, but in
a different order, viz. - - 2 : 3 : : 24 : 36,
and - - 3 : 9 : : 8 : 24.
then, caſting out the mean terms in each rank, it is con-
cluded that - - - - 2 : 9 : : 8 : 36,
that is, the firſt is to the 3d in the firſt rank,
as the firſt is to the 3d in the 2d rank.

INSCUA RIVER, is laid down in ſome maps as the north-weſtern and main branch of St Croix river, an eaſtern water of the Miſſiſſippi, riſing in the 48th degree of north latitude.—*Morſe.*

INSECTS (See *Encycl.*). A number of non-deſcript little animals was diſcovered by La Martiniere the naturaliſt when accompanying Perouſe on his celebrated voyage of diſcovery. Theſe animals he called *inſects*, and to many of them he gave particular names. Of theſe we ſhall give his deſcription in this place, leaving our readers, as he has left his, to arrange them properly according to the Linnæan claſſification.

"The inſect, which is figured N° 1. inhabits a ſmall priſmatic triangular cell, pointed at the two extremities, of the conſiſtence and colour of clear brittle ice; the body of the inſect is of a green colour, ſpotted with ſmall bluiſh points, among which are ſome of a golden tinge; it is fixed by a ligament to the lower part of its ſmall habitation: its neck is terminated by a ſmall blackiſh head compoſed of three converging ſcales, in the form of a hat, and encloſed between three fins, two of them large and channelled in the upper part (A) and one ſmall, ſemicircular (B). When it is diſturbed, it immediately withdraws its fins and its head into its cell, and gradually ſinks into the water by its own ſpecific gravity. Fig. 2. repreſents the under ſide of the priſm, ſhewing in what manner it is channelled, in order to allow free paſſage to the animal when it wiſhes to ſhut itſelf up in it. Fig. 3. repreſents the profile of the ſame. The movement carried on by the two larger fins, which are of a ſoftiſh cartilaginous ſubſtance, may be compared to that which would be produced by the two hands joined together in the ſtate of pronation, and forming, alternately, two inclined planes and one horizontal plane: it is by means of this motion that it ſupports itſelf on the top of the water, where it probably feeds on fat and oily ſubſtances on the ſurface of the ſea." Our author found it near Nootka, on the north-weſt coaſt of America, during a calm.

Fig. 4. repreſents a collection of inſects, as our author calls them, conſiſting only of oval bodies, ſimilar to a ſoap bubble, arranged in parties of three, five, ſix, and nine: among them are alſo ſome ſolitary ones. Theſe collections of globules, being put into a glaſs filled with ſea-water, deſcribed a rapid circle round the glaſs by a common movement, to which each individual contributed by ſimple compreſſion of the ſides of its body, probably the effect of the re-action of the air with which they were filled. It is not, however, eaſy to conceive how theſe diſtinct animals (for they may be readily ſeparated without deranging their economy) are capable of concurring in a common motion. "Theſe conſiderations (ſays our author), together with the form of the animal, recalled to my mind, with much ſatisfaction, the ingenious ſyſtem of M. de Buffon; and I endeavoured to perſuade myſelf, that I was about to be witneſs to one of the moſt wonderful phenomena of Nature, ſuppoſing that theſe molecules, which were now employed in increaſing or diminiſhing their number, or performing their revolutions in the glaſs, would ſoon aſſume the form of a new animal of which they were the living materials. My impatience led me to detach two from the moſt numerous group, imagining that this number might perhaps be more favorable to the expected metamorphoſis. I was, however, miſtaken. Theſe I examined with more attention than the reſt; and the following account is of their proceedings alone. Like two ſtrong and active wreſtlers, they immediately ruſhed together, and attacked each other on every ſide: ſometimes one would dive, leaving its adverſary at the ſurface of the water; one would deſcribe a circular movement, while the other remained at reſt in the centre; their motions at length became ſo rapid as no longer to allow me to diſtinguiſh one from the other. Having quitted them for a ſhort time, on my return I found them reunited as before, and amicably moving round the edge of the glaſs by their common exertions."

Fig. 5. repreſents a ſingular animal, which has a conſiderable reſemblance to a little lizard; its body is of a firm, gelatinous conſiſtence; its head is furniſhed on each ſide with two ſmall gelatinous horns, of which the two hindermoſt are ſituate the furtheſt inward: its body is provided with four open fan-like paws, and ſome appendages near the inſertion of the tail, and terminates like that of a lizard: the ridge of the back is divided the whole way down by a band of a deep blue; the reſt of the body, as well as the inſide of its paws, is of a bright ſilvery white. It appears to be very ſluggiſh in its motions; and when diſturbed by the finger, merely turned itſelf belly upwards, ſoon afterwards reſuming its former poſition. Fig. 6. repreſents it reverſed. Martiniere caught it during a calm at the landing place on the Baſhee-Iſlands.

INSTITUTE is a name which has lately been ſubſtituted for *ſchool* or *academy*. Formerly *inſtitution*, in the propriety of the Engliſh language, was ſometimes uſed as a word of the ſame import with *inſtruction*; and now *inſtitute* is employed, eſpecially by the admirers of French innovations, to denote what had hitherto been called an academy. When royalty was aboliſhed in France, it would have been abſurd to continue the titles *Royal* Academy of Sciences, *Royal* Academy of Inſcriptions, &c.; but inſtead of merely aboliſhing the word *royal*, and ſubſtituting *national* in its ſtead, it occurred to the fertile brain of Condorcet, to aboliſh the ſeven academies themſelves, or rather to melt them all down into one great academy; to which was given the appellation of the

National INSTITUTE, or *New Academy of Arts and Sciences*. This academy, founded on a decree of the new conſtitution, was opened on the 7th of December 1795, when BENEZECH, the then miniſter for the home department, attended, and the decree of foundation was read; which was to the following purport:

"The Academy of Arts and Sciences belongs to the whole republic, and Paris is its place of reſidence. Its employment is to aim at bringing all arts and ſciences to the utmoſt perfection of which they are capable. It is to notice every new attempt, and all new diſcoveries, and to keep up a correſpondence with all foreign literary ſocieties. And by the particular orders of the Executive Directory, its firſt ſtudies are to be directed to thoſe ſubjects which more immediately tend to the reputation and advantage of the French republic."

The academy is to conſiſt of 288 members, half of whom are to reſide in Paris, the other half in the departments; and to them is to be added a certain number of foreigners, as honorary members, confined at preſent to twenty-four.

The academy is divided into three claſſes, each claſs into ſections, each ſection to contain twelve members.

1ſt claſs. Mathematics and natural philoſophy. This claſs is divided into ten ſections. 1. Mathematics. 2. Mechanical arts. 3. Aſtronomy. 4. Experimental philoſophy. 5. Chemiſtry. 6. Natural hiſtory. 7. Botany. 8. Anatomy and animal hiſtory. 9. Medicine and ſurgery. 10. Animal œconomy, and the veterinary ſcience.

2d claſs. Morality and politics. This claſs conſiſts of ſix ſections. 1. Analyſis of ſenſations and ideas. 2. Morals. 3. Legiſlature. 4. Political economy. 5. Hiſtory. 6. Geography.

3d claſs. Literature and the fine arts. This claſs conſiſts of eight ſections. 1. Univerſal grammar. 2. Ancient languages. 3. Poetry. 4. Antiquities. 5. Painting. 6. Sculpture. 7. Architecture. 8. Muſic.

For each claſs a particular room in the Louvre is appropriated. No one can be a member of two claſſes at the ſame time, but a member of one claſs may be preſent at the meetings of any other. Each claſs is to print, yearly, an account of its tranſactions.

Four times a-year there are to be public meetings. On theſe occaſions, the three claſſes meet together. At the end of each year, they are to give a circumſtantial account to the legiſlative body of the progreſs made in that year in the arts and ſciences. The prizes given yearly by each claſs are to be publicly notified at certain times. The ſums requiſite for the ſupport of the inſtitution are to be decreed yearly by the legiſlative body, upon a requiſition made by the Executive Directory.

The firſt forty-eight members were choſen by the Executive Directory, to whom the choice of the remaining members was confided. To the members, reſidentiary in Paris, is reſerved the choice both of the department and the foreign members. On a vacancy in any claſs, three candidates are named by the claſs for the choice of the body at large.

Each claſs is to have, at its place of meeting, a collection of the products, both of nature and art, and a library, according to its particular wants.

The regulations of the inſtitution, with reſpect to the times of meeting, and its employments, are to be drawn up by the body at large, and laid before the legiſlative aſſembly.

The hall in which the body at large holds its meetings, forms part of the weſt wing of the Old Louvre, at preſent called the Muſeum. It formerly went by the appellation of the Hall of Antiques *(Salle des Antiques)*; and as long as the kings inhabited this part of the palace, was occupied by their guards, from which circumſtance it obtained the name of the Hall *des Cent Suiſſes*. It was likewiſe appropriated to banquets and entertainments, given by the court on gala days; and it was to this place that Henry IV. was conveyed, on his aſſaſſination by Ravaillac, in the *Rue de la Ferronnerie*.

It was built at the ſame time with the reſt of this part of the Louvre, about the year 1528, after the deſigns of Pierre Leſcot, abbot of Clagny. It is 144 feet in length, and 40 in breadth, and holds from 1000 to 1200 perſons. In order to adapt it to its new deſtination, the floor has been ſunk, which gives a greater air of lightneſs to the roof. In the centre ſtands a double table, in the form of a horſe-ſhoe, ſupported by ſphinxes, at which the members of the inſtitute take their ſeats. This table is ſurrounded by two tiers of benches, which are raiſed for the accommodation of ſpectators, who have likewiſe ſeats provided for them in the vaſt embraſures of the windows, and at each extremity of the hall.

Whether ſcience will be advanced by the ſeven royal academies having been melted into one, time muſt determine; but candour compels us to acknowledge, that the proceedings of the national inſtitute have hitherto been abundantly intereſting. Intimately connected with the national inſtitute is the French ſyſtem of

National Instruction, which is likewiſe novel, and therefore ſufficiently curious to deſerve notice in a Work of this kind. When the Chriſtian religion was aboliſhed in France, it was impoſſible to continue the univerſities and other ſeminaries which were founded by Chriſtians, and obliged by their conſtitution to teach, whether pure or not, the doctrines of Chriſtianity. They were accordingly all ſwept away, and a new ſyſtem of education planned, which was to be carried on in what they call

The Primary Schools.
The Central Schools.
The School of Health.
The School of Oriental Languages.
The Polytechnic School.
The National inſtitute.
The Jury of Public Inſtruction.
The Commiſſion of Public Inſtruction.
The Legiſlative Committee of Inſtruction. And various other national eſtabliſhments for the improvement of particular ſciences.

The firſt degree of public inſtruction is to be met with in the *Ecoles Primarées*, eſtabliſhed by a decree of the convention of the ſecond *Pluvioſe*, in the ſecond year of the republic (A). Every diſtrict is furniſhed with one of theſe ſchools; the profeſſors or maſters in which are paid from the national treaſury; and to which every head of a family, without exception, is compelled by law to ſend its children for inſtruction. The ſubjects taught in theſe primary or elementary ſchools are divided into nine claſſes:

1ſt, Inſtructions connected with the phyſical and moral ſituation of children, prior to their entering into theſe ſchools. *2d*, Similar inſtructions as a guide to teachers in the national ſchools. *3d*, The arts of reading and writing. *4th*, The elements of French grammar. *5th*, Elements of arithmetic and geometry, with the theory of the new menſuration. *6th*, The elements of geography. *7th*, Explanations of the principal phenomena and productions of nature. *8th*, Elements of agriculture. *9th*, Elements of republican morals.

Next to the primary ſchools in rank and conſequence are the *Ecoles Centrales*, which were eſtabliſhed by a decree of the Convention of the ſeventh *Ventoſe* in the third year. They are ſituated in the capital of every department, bearing the proportion of one central ſchool to 300,000 inhabitants. In theſe ſchools the republican youths are taught the ſciences, and their application in real life. In each of them are profeſſors for the following branches:

1. For mathematics. 2. Experimental philoſophy and chemiſtry. 3. Natural hiſtory. 4. Agriculture and commerce. 5. Logic and metaphyſics. 6. Political economy and legiſlation. 7. The philoſophical hiſtory of nations. 8. The art of healing. 9. Arts and manufactures. 10. Univerſal grammar. 11. The belles lettres. 12. The ancient languages. 13. The modern languages. 14. The fine arts.

Each central ſchool is furniſhed with an extenſive public library—a botanic garden—a cabinet of natural hiſtory—an apparatus for experimental philoſophy—and

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(A) We would tranſlate this chronological jargon into the language of Chriſtian Europe, were we not perſuaded that the French calendar, the French conſtitution, and the French inſtitutes, will have the ſame duration: we truſt in God not a long duration. For *Pluvioſe*, and the other fantaſtical names of months introduced into this article, ſee REVOLUTION, *Encycl.* n° 184.

and a collection of machines and models connected with the arts and manufactures.

The profeſſors of each ſchool hold, every month, a public ſitting, in which conferences are held relative to ſubjects connected with the improvement of letters, the ſciences, and the arts, which are the moſt beneficial to ſociety.

The object in the eſtabliſhment of the primary and central ſchools was, the general inſtruction of all claſſes of the citizens; and it being incompatible with the perfect completion of that important purpoſe, to expect from them the propagation of particular branches of ſcience, it became neceſſary to eſtabliſh other literary and ſcientific academies.

Accordingly, the French government have founded, *1ſt*, Schools of health *(les ecoles de ſante)*, in Paris, Straſburgh, and Montpelier, where medicine and ſurgery are ſtudied; which ſchools are affirmed, by thoſe who find nothing wrong in France, to be the moſt perfect of their kind, as well as new and unparalleled models for ſuch inſtitutions.

2d, Two ſchools for Oriental languages, in the national library, and in the college of France.

3d, The Polytechnic ſchool in Paris, or central ſchool for the direction of public works. This eſtabliſhment is very generally admired and conſidered as a model for imitation. It contains more than 400 young perſons, previouſly educated in the mathematics, and the majority of them intended for engineers in various lines; and they labour under the immediate direction of their tutors nine hours every day. It occupies the principal part of the *Palais de Bourbon* in Paris, and is furniſhed with a large collection of inſtruments and models. The journal of the Polytechnic ſchool, which is publiſhed by the bookſellers Regent and Bertrand at Paris, is a perfectly original work, and admirably calculated to convey uſeful information.

Of the national inſtitute a ſufficient account has been given in the preceding article. We proceed therefore to the jury of public inſtruction *(Le Jury Central d'Inſtruction)*, of which the principal buſineſs is to ſuperintend the primary and central ſchools. It appoints the profeſſors in theſe ſchools, and examines into their conduct. Like the legiſlative body it is renewed by a third every half year. When they have choſen a profeſſor for a central ſchool, they ſubmit their choice to the department; and, in caſe of diſapprobation, they make another appointment. To this jury of public inſtruction the profeſſors in the central ſchools are amenable for all miſconduct connected with their offices; it may expel them, but all its deciſions muſt be ſubmitted for confirmation to the tribunal of the department.

There is alſo eſtabliſhed at Paris a ſupreme council, called The commiſſion of Public Inſtruction, to which is entruſted the whole executive department. The preſervation of the national monuments, of public libraries, muſeums, cabinets, and valuable collections; the ſuperintendance of all the ſchools and the modes of inſtruction; all new inventions and ſcientific diſcoveries; the regulation of weights and meaſures; national ſtatiſtics and political economy, are all placed under the authority of this ſupreme commiſſion. For the commodious and regular execution of ſo many complicated branches of buſineſs, there is a large office, called *Le Secretariat*, which is divided into three departments.

1. For the regulation of the different kinds of inſtruction; of the modes of education in the ſchools; and for the choice of elementary books. 2. For weights and meaſures; inventions and diſcoveries; libraries and bibliography; muſeums, works of art, and literary rewards and encouragements. 3. For theatres, national feaſts, republican inſtitutions, and the erection of monuments.

As all public eſtabliſhments require the ſuperintendance and occaſional correction of the legiſlature, in addition to that of their own immediate executive authority, it has been deemed neceſſary to appoint a permanent committee of inſtruction in the legiſlative body, to provide ſuch ſums as may be neceſſary for the preſervation and improvement of this ſyſtem of inſtruction. This legiſlative committee are inveſted with due authority for theſe purpoſes. Their objects are preciſely the ſame as thoſe of the commiſſion of public inſtruction above deſcribed, only with this difference, that the latter ſuperintends the execution of exiſting laws, whilſt the former receives and improves them, or propoſes new ones. This committee is divided into three departments, as is the commiſſion, with exactly the ſame arrangement of their reſpective labours. The committee being charged with the enaction of all new laws, its members, with a view to obtain accurately all the requiſite information relative to the numerous branches of the arts, have procured from the legiſlative body the appointment of a *commiſſion temporaire des arts* to be annexed to them, and to meet in the ſame houſe with them; which temporary commiſſion is divided into ſixteen claſſes: viz. 1. For Zoology; 2. Botany; 3. Mineralogy; 4. Phyſics; 5. Chemiſtry; 6. Anatomy; 7. Machinery; 8. Geography; 9. Artillery and Fortification; 10. Medals and Antiquities; 11. Bibliography; 12. Painting; 13. Architecture; 14. Sculpture; 15. Bridges and Cauſeways; and, 16. Muſical Inſtruments.

The improvements of the national literary and ſcientific eſtabliſhments are numerous and important.

1ſt, By a decree of the convention of the 11th *Prairial*, in the ſecond year, it was enacted, that means ſhould be adopted by which every poſſible advantage might be derived from the botanic gardens of the republic, in Turkey and other foreign countries. This politic decree clearly tended to render France, in the language of the reporter, *L'abregè de tous les climats, et l'entrepôt de l'Europe.* "The epitome of every climate, and the magazine of Europe." Thoſe plants which thrive between the tropics may be cultivated in the ſouth of France; and thoſe which are the produce of northern climates, may be cultivated in the northern departments; by which means, France will be in poſſeſſion of all foreign plants and drugs, without the exportation of ſpecie.

2d, The National Bibliography was decreed in the ſitting of 22d *Germinal*, in the ſecond year. It conſiſts of a complete catalogue of books of all deſcriptions, the property of the nation; it was then aſcertained, that the republic poſſeſſed more than ten millions of books. The titles of them were to be adjuſted by actual compariſons; the manuſcripts to be regiſtered ſeparately; anonymous productions were to be arranged according to their ſubjects; and thoſe of known authors in the alphabetical order of the names. The ſeveral editions to be claſſed according to their dates: and what may be deemed more important, this French National Bibliography will contain a dictionary of anonymous books, as well as thoſe publiſhed under fictitious names, a deſideratum in the republic of letters.

3*d*, The annihilation of all *patois*, or dialects, decreed in the ſitting of the 16th *Prairial*, in the ſecond year. Notwithſtanding the univerſality of the French language, and that it was excluſively ſpoken in the majority of the inland departments, yet there exiſted thirty various dialects in France. It is more aſtoniſhing that Rozier had remarked, that between one neighbouring village and another, there was ſo conſiderable a difference in the dialect, that the inhabitants could not underſtand each other; and the vineſtock had thirty different names. The naturaliſt, Villars, has ſtated, that in the nomenclature of vegetables, in the departments, he had only met with an hundred which had a common appellation.

4*th*, The eſtabliſhment of the *Conſervatoire des Arts et Métiers*, was decreed in the ſitting of the 8th of *Vendemiaire*, in the third year. This conſiſts of a ſpacious hall, in the form of an amphitheatre, and contains the inſtruments and the models of machinery connected with the arts, and a deſcription of their uſes, with every book relating to them. Annexed to this eſtabliſhment are three expoſitors and a draughtſman, who explain to the ſtudents the uſe of each inſtrument, and who regiſter every new diſcovery, which is preſented to the *Bureau de Conſultation*, to the lyceum of arts, the *ci-devant* academy of ſciences, or to the board of commerce.

5*th*, The eſtabliſhment of the board of longitude was decreed in the ſitting of the 7th of *Meſſidor*, third year. It was certainly a diſgrace under the monarchy, that an aſtronomical and nautical eſtabliſhment, which had already proved ſo beneficial to Great Britain, ſhould not have been adopted in France. In conſequence of this decree, the French board is now as complete as the Engliſh. It conſiſts of ten members, and has under its juriſdiction the national obſervatory at Paris, and all the aſtronomical inſtruments belonging to the republic. It correſponds with foreign aſtronomers; delivers public lectures on aſtronomy and navigation; and its proceedings are annually recited in a public ſitting.

6*th*, The general ſchool of the Oriental languages was eſtabliſhed by a decree of the 10th of *Germinal*, in the fourth year. This ſchool adjoins to the national library, and all the books and manuſcripts relative to Oriental literature are depoſited in it.

7*th*, The national muſeum of antiquities was decreed in the ſitting of 20th of *Prairial*, fourth year. A ſchool of this deſcription was ſucceſsfully eſtabliſhed at Vienna, by Eckel; at Gottingen, by Heyne; at Leipſick, by Erneſt; and even at Straſburgh, by the celebrated Obeilin: Paris was, however, without one. This national archeology, or ſcience of antiquity, is divided into nine different claſſes: inſcriptions, characters, ſtatues, *bas reliefs*, ſculptures, paintings, moſaics, medals, civil, religious, and military inſtruments. This extenſive eſtabliſhment is under the direction of two principal profeſſors; *le Conſervateur Profeſſeur, et le Conſervateur Bibliothecaire.* The province of the former is to deliver public lectures on the ſeveral branches of antiquities, to teach the theory of medals and engravings, the hiſtory of the arts among the ancients, &c. The duties of the latter are merely of a bibliographical nature.

8*th*, The new modelling of the Grand National Library, was decreed in the ſitting of 25th *Vendemiaire*, in the fourth year. By virtue of this decree, the place of librarian in chief was ſuppreſſed, and the whole eſtabliſhment placed under a *conſervatoire* of eight members; of whom two were appointed for the ſuperintendance of printed books; two for manuſcripts; two for antiquities; and two for engravings. From theſe a temporary director is annually choſen, who ſuperintends the whole, acts occaſionally as preſident of this aſſembly, and maintains a regular correſpondence with the conſtituted authorities relative to the concerns of the library.

9*th*, The augmentation of the Muſeum of Natural Hiſtory, formerly called *Le Jardin Royal des Plantes*. This eſtabliſhment was decreed the 15th *Brumaire*, third year, upon a report of Thibadeau, in the name of the committee of Public Inſtruction. Beſides the addition of large rooms, and various other buildings, there are new collections of natural curioſities and productions; and the library is much increaſed. It is open to the public three times a week. At ſtated periods all the naturaliſts in Paris deliver courſes of lectures in the various branches of natural hiſtory. The muſeum is ſaid to have received greater improvements from this augmentation than from all the labours of Buffon, or from its foundation, ſince the time of Tournefort.

10*th*, The *Ecole des Mines* was eſtabliſhed in the *Hotel des Monnaies*, and has for its direction the naturaliſt Le Sage. This inſtitution is unrivalled in Europe; and the collection of mineralogical curioſities ſurpaſſes whatever can be conceived.

11*th*, The ſociety of natural hiſtory in Paris, deſervedly claſſes among thoſe which have rendered the greateſt ſervices to the cauſe of ſcience ſince the revolution. A lecture of public inſtruction is held every ten days, which is generally given by one of the members, and which is open to all the lovers of natural hiſtory. Premiums are propoſed for diſſertations; one of which, by the late C. Herman, jun. (whoſe early deceaſe was a great loſs to the republic of letters) on the *apterous* claſs of inſects, may be ſaid to conſtitute an epocha in the annals of natural hiſtory. The ſociety has publiſhed a volume of memoirs, in folio, entitled, "*Tranſactions of the Society of Natural Hiſtory.*" It has likewiſe erected a ſtatue to the great Linnæus, in the national garden of plants; and, at the period when every public inſtruction was ſuſpended, gave lectures on the different branches of ſcience belonging to its department. Several intelligent and ſkilful navigators, among others thoſe ſent in ſearch of the unfortunate La Pérouſe, as well as thoſe which accompanied Buonaparte on his romantic expedition to Egypt, were members of this ſociety.

This ſtatement of facts relative to the preſent ſtate of public inſtruction, the ſciences, the arts, and the progreſs of national literature in France, has been taken from a miſcellany, of which the principal writers are well acquainted with what is doing in that diſtracted country. They call it a ſublime ſyſtem; and ſeem to conſider the increaſe of the national library, the improvement of the botanic gardens, and the diſcoveries that have been made by the different ſchools or inſtitutes, as furniſhing a demonſtration that the republican government is more favourable to the advancement of ſcience, than the monarchical, whether abſolute or limited. But it ſhould not be forgotten, that this ſyſtem is yet in its infancy; and that in proſecuting new ſchemes, all men, and more eſpecially Frenchmen, are actuated by an enthuſiaſm which gradually cools as their purſuits become familiar. We ſhall therefore venture to predict, that the different ſchools will not diſplay ſuch ardour twenty years hence as they do at preſent; and that if the republican government continue thirty years in France, the progreſs of ſcience in that country will not be more rapid than it was under the monarchy. We muſt remember, too, that the French libraries, muſeums, and picture galleries, have been improved by means which the morals of other governments do not employ—by rapine and robbery.

That ſomething may be learned from this ſyſtem to improve the modes of education in other countries, we admit; and it is for that reaſon that we have inſerted an account of it. But if it contains ſomething worthy of imitation, it contains likewiſe much to be ſhunned. We do not think it conſiſtent with the *rights of man* to *compel* parents to ſend their children to be educated in *particular* ſchools; eſpecially in ſchools where not only religious inſtruction is omitted, but where, there is reaſon to believe, that the profeſſors are at pains to raze all religious impreſſions from the youthful mind. In a nation denying the truth of Chriſtianity, it is not to be ſuppoſed that the Chriſtian religion will be publicly taught; but in a nation of philoſophers, as the French call themſelves, it might have been expected that the laws of religious toleration would have been ſo far regarded, that Chriſtian parents would not have been *compelled* to ſend their children to *antichriſtian* ſchools! But it is not Chriſtianity alone that is neglected in this *ſublime* ſyſtem of education. Though the legiſlative body has ſome time ago decreed that there is a God, there is not in any one of thoſe ſchools the ſmalleſt care taken to inſtruct the republican youth in the principles even of natural religion! We might indeed have looked for it under the title *Metaphyſics*, had not the conſtitution of the National Inſtitute taught us, that French metaphyſics attend to nothing but the analyſis of ſenſations and ideas. Yet the legiſlators might have liſtened on this ſubject to a republican as ſound as themſelves, and who was likewiſe no friend to ſuperſtition. "Nam et Majorum inſtituta tueri ſacris, ceremoniiſque retinendis ſapientis eſt. Non ſolum ad religionem pertinet, ſed etiam ad *civitatis* ſtatum, ut ſine iis, qui ſacris publice præſunt, religioni privatæ ſatisfacere non poſſint." *Cicero de Nat. Deorum.*

INSURANCE, in law and commerce, though an excellent inſtitution, is not of high antiquity. The oldeſt laws and regulations concerning inſurance, with which the indefatigable Beckmann is acquainted, are the following:

On the 28th of January 1523, five perſons appointed for that purpoſe drew up at Florence ſome articles which are ſtill employed on the exchange at Leghorn. Theſe important regulations, together with the preſcribed form of policies, which may be conſidered as the oldeſt, have been inſerted, in Italian and German, by Magens, in his Treatiſe on Inſurance, average, and bottomry, publiſhed at Hamburgh in 1753.

There is ſtill preſerved a ſhort regulation of the 25th May 1537, by the Emperor Charles V. reſpecting bills of exchange and inſurance, in which the ſtrictly fulfilling only of an agreement of inſurance is commanded.

In the year 1556, Philip II. king of Spain, gave to the Spaniſh merchants certain regulations reſpecting inſurance, which are inſerted by Magens, with a German tranſlation, in his work before-mentioned. They contain ſome forms of policies on ſhips going to the Indies.

In the year 1598, the *Kamer von aſſurantie*, chamber of inſurance, was eſtabliſhed at Amſterdam. An account of the firſt regulations of this inſurance office may be ſeen in Pontanus's Hiſtory of the city of Amſterdam, and in other works.

In the year 1600, regulations reſpecting inſurance were formed by the city of Middelburg in Zealand.

It appears that the firſt regulations reſpecting inſurances in England, which may be ſeen in *Anderſon's Hiſtory of Commerce*, were made in the year 1601. We find by them, that inſurers had before that period conducted themſelves in ſuch a manner, that the utmoſt confidence was repoſed in their honeſty, and that on this account few or no diſputes had ariſen.

Of the various policies for inſurance in England, a pretty accurate account will be found in the *Encyclopædia*; but there is one of them, of which our account muſt be acknowledged to be now defective. This is,

INSURANCE on lives; which is a policy that has greatly increaſed, in conſequence of its utility being more generally underſtood. Of the two offices for life-aſſurances, noticed in that article, the former, entitled the *Amicable Society*, has extended the number of its ſhares to 4000; but, as we have already obſerved, the nature of the inſtitution is too limited to become of general importance. The latter, entitled, the *Society for Equitable Aſſurances on Lives and Survivorſhip*, is undoubtedly one of the moſt important inſtitutions of the kind, as will appear by the following account, with which we have been favoured by an obliging correſpondent, and upon the accuracy of which our readers may depend:

The members of the equitable ſociety, finding, in June 1777, that their affairs were in a flouriſhing ſituation, reſolved to reduce their annual premiums one tenth; and in 1782, adopted new tables agreeable to the probabilities of life at Northampton, in lieu of thoſe they had hitherto uſed, formed from the London bills of mortality. But though it was evident, that the new tables were much better adapted for aſſuring promiſcuouſly perſons reſiding in the country, or in large towns, it was thought proper, for greater ſecurity, to make an addition of 15 per cent. to the real value of the aſſurances, as computed from the table of mortality at Northampton; and with the view of making an adequate compenſation to the aſſured for their former payments, which had been ſo much higher than would be required by the new rates, an addition was made to their claims of L.1 : 10s. per cent. for every premium they had paid. The conſequence of theſe meaſures proved highly favourable to the ſociety; for its buſineſs increaſed ſo faſt, that in 1785 it was nearly doubled; the ſums aſſured amounting to upwards of L.720,000. At this period, the favourable reſult of a minute and very laborious inveſtigation of the ſtate of the ſociety, induced them to take off the 15 per cent. charged upon the premiums in 1782, and make a further addition to the claims of L.1 per cent. for every payment made prior to the 1ſt January 1786. A ſtill greater increaſe of ſucceſsful buſineſs determined them, in 1791, to make another addition of L.1 per cent. to the claims; and in the following year, a further addition of L.2 per cent.; by which the claims upon aſſurances of the year 1770 were more than doubled; and thoſe of an earlier date increaſed in a ſtill higher proportion. By theſe advantages to its members, and the honourable and truly equitable manner in which the concerns of the ſociety are tranſacted, the augmentation of their buſineſs has been ſo great, that on the 31ſt December 1792, the ſums aſſured (without including the additions made to them) amounted to upwards of L.3,000,000; and on the 31ſt December 1795, to about L.4,000,000.

The rates of aſſurance, as reduced to their real values in 1786, and according to which the ſociety now tranſact buſineſs, are as follows:

Sum Aſſured £.100.

Age.	*One Year.*	*Seven Years.*	*Whole Life.*
15	£.0 17 11	£.1 2 11	£.1 18 7
20	1 7 3	1 9 5	2 3 7
25	1 10 7	1 12 1	2 8 1
30	1 13 3	1 14 11	2 13 4
35	1 16 4	1 18 10	2 19 10
40	2 0 8	2 4 1	3 7 11
45	2 6 8	2 10 10	3 17 11
50	2 15 1	3 0 8	4 10 10
55	3 5 0	3 12 0	5 6 4
60	3 18 1	4 7 1	6 7 4
65	4 15 2	5 10 10	7 16 9

The other offices in London for the aſſurance of lives are, the *Royal Exchange Aſſurance*, the *Weſtminſter, Society*, and the *Pelican Life Office.*

The corporation of the *Royal Exchange Aſſurance* was empowered to aſſure lives by its ſecond charter, dated 29th April 1721; but the original object of the company being ſea aſſurances, and the true principles of aſſuring on lives being at that time little underſtood, this branch of their buſineſs was at firſt comparatively ſmall: they generally required a premium of five or ſix guineas per cent. without any regard to the age; and the aſſurance, which was uſually for a ſmall ſum, was ſeldom for a greater term than one year. In this manner they continued to aſſure upon lives till the end of the year 1783, when the increaſing importance of this part of their buſineſs, which they had ſome years felt, induced them to adopt a regular table of rates of aſſurance, according to the Northampton regiſters of mortality, but with a greater addition to the real values than had been made by the "Society for Equitable Aſſurances on Lives and Survivorſhip." This was thought proper, from the conſideration that the aſſurers with the Royal Exchange company are not in any caſe liable to a call upon them beyond the premium they engage to pay, and have the ſecurity of the capital and funds of the company ariſing from the other branches of their buſineſs; however, the company, finding themſelves ſucceſsful in their life aſſurances, determined, in 1790, to reduce their premiums; and in 1797 made a ſtill greater reduction, by which they are brought very near to thoſe above ſtated. This company have agents in all the principal towns of Great Britain, and are impowered to aſſure lives in all parts of the world.

The *Weſtminſter Society* was eſtabliſhed in 1792, for aſſuring lives, and granting annuities. Their terms are nearly the ſame as thoſe of the Royal Exchange Aſſurance; but not being a corporate body, every perſon aſſuring ſigns a declaration, that he accepts the joint ſtock of the ſociety as his ſecurity.

The *Pelican Life Office* was inſtituted in 1797, by ſome of the principal proprietors of the Phœnix Fire Office. The rates which they have publiſhed vary conſiderably from thoſe of the other offices; but whether they are founded on more juſt principles, time and experience muſt determine. This ſociety alſo makes a new ſpecies of aſſurance, by way of endowment for daughters, or for children generally, when they ſhall attain the age of twenty-one years.

INTEGRAL CALCULUS, in the new analyſis, is the reverſe of the differential calculus, and is the finding of the integral from a given differential; being ſimilar to the inverſe method of fluxions, or the finding the fluent to a given fluxion. See FLUXIONS, *Encycl.*

INTEREST, is the allowance given for the uſe of money by the borrower to the lender, and is either *ſimple* or *compound.* The method of computing both intereſts is explained in the article ALGEBRA, (*Encycl.*) page 427, &c.; and the ſubject of ſimple intereſt is again reſumed in ARITHMETIC, (*Encycl.*) n° 20. The application of the canons for the computation of compound intereſt, to the value of annuities, the only caſe in which that intereſt is allowed by the laws of this country, may be ſeen in the articles ANNUITY and SURVIVORSHIP, (*Encycl.*); where various tables are given to facilitate the different computations. Some of our readers, however, have expreſſed a wiſh to have the rule for computing compound intereſt ſo ſtated, as to be underſtood by thoſe who are unacquainted with algebraic ſymbols. Their wiſh may be eaſily gratified.

The general formula $S = pR^t$ anſwers for the amount of any ſum, whether the intereſt be payable yearly, half-yearly, quarterly, or daily. Let R denote the amount of one pound for the firſt payment, and t the number of payments, the unit being from the commencement till the firſt payment is due; alſo, let l denote the logarithm of any quantity before which it is wrote; then, from the known property of logarithms, the theorem may be expreſſed thus, $l.\,S = l.\,p + l.\,R \times t$.

Required the amount of L.250 at 5 per cent. compound intereſt, for 12 years, reckoning the intereſt payable yearly, half-yearly, quarterly, and daily?

Yearly. $p = 250$, $R = 1{\cdot}05$, $t = 12$.

$$
\begin{array}{rl}
0{\cdot}0211893 & = l.\,R \\
12 & \\
\hline
{\cdot}2542716 & = l.\,R \times t. \\
2{\cdot}3979400 & = l.\,p. \\
\hline
\end{array}
$$

$l.\,S = 2{\cdot}6522116$—L.448 : 19 : $3\frac{1}{4}$ = Amount.

250

198 : 19 : $3\frac{1}{4}$ = Comp. intereſt.

Half yearly, $p = 250$, $R = 1{\cdot}025$, $t = 24$.

$0{\cdot}0107239 = l.\,R.$

24

428956

214478

$\cdot 2573736 = l.\,R \times t.$

$2{\cdot}3979400 = l.\,p.$

$l.\,S = 2{\cdot}6553136$ — L. $452 : 3 : 7\frac{3}{4}$ = Amount.

250

$202 : 3 : 7\frac{3}{4}$ = Intereſt.

Quarterly. $p = 250$, $R = 1{\cdot}0125$, $t = 48$.

$0{\cdot}0053950 = l.\,R.$

48

431600

215800

$\cdot 2589600 = l.\,R \times t.$

$2{\cdot}3979400 = l.\,p.$

$l.\,S = 2{\cdot}6569000$ — L. $453 : 16 : 8\frac{3}{4}$ = Amount.

250

$203 : 16 : 8\frac{3}{4}$ = Intereſt.

Daily, $p = 250$, $R = 1 + \frac{\cdot 05}{365} = \frac{365{\cdot}05}{365}$, $t = 365 \times 12$.

$2{\cdot}5623524$

$2{\cdot}5622929$

$\cdot 0000595 = l.\,R.$

4380

47600

1785

2380

$\cdot 2606100 = l.\,R \times t.$

$2{\cdot}3979400 = l.\,p.$

$l.\,S = 2{\cdot}6585500$ — L. $455 : 11 : 3\frac{1}{2}$ = Amount.

250

$205 : 11 : 3\frac{1}{2}$ = Intereſt.

INTERPOLATION, in the modern algebra, is uſed for finding an intermediate term of a ſeries, its place in the ſeries being given. See ALGEBRA and SERIES, *Encycl.*

The method of interpolation was firſt invented by Mr Briggs, and applied by him to the calculation of logarithms, &c. in his Arithmetica Logarithmica, and his Trigonometria Britannica; where he explains, and fully applies, the method of interpolation by differences. His principles were followed by Reginal and Mouton in France, and by Cotes and others in England. Wallis made uſe of the method of interpolation in various parts of his works; as his arithmetic of infinites, and his algebra, for quadratures, &c. The ſame was alſo happily applied by Newton in various ways: by it he inveſtigated his binomial theorem, and quadratures of the circle, ellipſe, and hyperbola. See Wallis's Algebra. chap. 85. &c. Newton alſo, in lemma 5. lib. 3. Princip. gave a moſt elegant ſolution of the problem for drawing a curve line through the extremities of any number of given ordinates; and in the ſubſequent propoſition, applied the ſolution of this problem to that of finding, from certain obſerved places of a comet, its place at any given intermediate time. And Dr Waring, who adds, that a ſolution ſtill more elegant, on ſome accounts, has been ſince diſcovered by Meſſ. Nichol and Stirling, has alſo reſolved the ſame problem, and rendered it more general, without having recourſe to finding the ſucceſſive differences. *Philoſ. Tranſ.* vol. 69. part 1. art. 7.

INTERSCENDENT, in algebra, is applied to quantities, when the exponents of their powers are radical quantities. Thus $x^{\sqrt{2}}$, $x^{\sqrt{a}}$, &c. are interſcendent quantities.

INTERSTELLAR, a word uſed by ſome authors to expreſs thoſe parts of the univerſe that are without and beyond the limits of our ſolar ſyſtem.

INTRADOS, the interior and lower ſide, or curve, of the arch of a bridge, &c. In contradiſtinction from the extrados, or exterior curve, or line on the upper ſide of the arch. See ARCH in this *Suppl.*

INVERNESS, NEW, a town on the river Alatamaha, in Georgia, built by a company of emigrants from the Highlands of Scotland, 130 of whom were brought over by Gen. Oglethorpe in 1734. It is about 20 miles from Frederica. Theſe ſettlers preſented a moſt pathetic and prophetic remonſtrance to Gen. Oglethorpe in January, 1738, againſt the introduction of ſlaves into the colony.—*Morse.*

INVOLUTION and EVOLUTION, are terms introduced into geometry by the celebrated Mr Huyghens, to expreſs a particular manner of deſcribing curvilineal ſpaces which occurred to him when occupied in the improvement of his noble invention of pendulum clocks. Although he was even aſtoniſhed at the accuracy of their motion, and they ſoon ſuperſeded all balance clocks, he knew that the wide vibrations were ſomewhat ſlower than the narrow ones, and that a circle was not ſufficiently incurvated at the ſides to render all the vibrations iſochronous. The proper curve for this purpoſe became an intereſting object. By a moſt accurate inveſtigation of the motions of heavy bodies in curved paths, he diſcovered that the cycloid was the line required. Lord Brouncker had diſcovered the ſame thing, as alſo Dr Wallis. But we do not imagine that Huyghens knew of this; at any rate, he has the full claim to the diſcovery of the way of making a pendulum oſcillate in a cycloidal arch. It eaſily occurred to him, that if the thread by which the pendulum hangs be ſuſpended between two curved cheeks, it would alternately lap on each of them in its vibrations, and would thus be raiſed out of the circle which it deſcribes when ſuſpended from a point. But the difficulty was to find the proper form of thoſe cheeks. Mr Huyghens was a moſt excellent geometer, and was poſſeſſed of methods unknown to others, by which he got over almoſt every difficulty. In the preſent caſe there was fortunately no difficulty, the means of ſolution offering themſelves almoſt without thought. He almoſt immediately diſcovered that the curve in queſtion was the ſame cycloid. That is, he found, that while a thread unwinds from an arch of a cycloid, beginning at the vertex, its extremity deſcribes the complementary arch of an equal cycloid.

Thus he added to this curve, already ſo remarkable for its geometrical properties, another no leſs curious, and infinitely exceeding all the others in importance.

The ſteps by which this property was diſcovered are ſuch direct emanations from general principles, that they immediately excited the mind of Mr Huyghens, which delighted in geometry, to proſecute this method of deſcribing or transforming curve lines by evolution. It is ſurpriſing that it had not ere this time occurred to the ancient geometers of the laſt century, and particularly to Dr Barrow, who ſeems to have racked his fancy for almoſt every kind of motion by which curve lines can be generated. Evolution of a thread from a curve is a much more obvious and conceivable geneſis than that of the cycloid invented by Merſennus, or that of the conchoid by Nicomedes, or thoſe of the conic ſections by Vieta. But except ſome vague expreſſions by Ptolemy and Gaſſendus, about deſcribing ſpirals by a thread unlapped from a cylinder, we do not recollect any thing of the kind among the writings of the mathematicians; and it is to Huyghens alone that we are indebted for this very beautiful and important branch of geometry. It well deſerves both of theſe epithets. The theorems which conſtitute the doctrines of evolution are remarkable for their perſpicuity and neatneſs. Nothing has ſo much contributed to give us clear notions of a very delicate ſubject of mathematical diſcuſſion, namely curvature, and the meaſure and variations of curvature. It had become the ſubject of very keen debate; and the notions entertained of it were by no means diſtinct. But nothing can give ſuch a preciſe conception of the difference of curvature, in the different parts of a cycloid or other curve, as the beholding its deſcription by a radius continually varying in length. This doctrine is peculiarly valuable to the ſpeculator in the higher mechanics. The intenſity of a deflecting force is eſtimated by the curvature which it induces on any rectilineal motion; and the variations of this intenſity, which is the characteriſtic of the force, or what we call its nature, is inferred from the variations of this curvature. The evolution and involution of curve lines have therefore great claim to our attention. But a Work like ours can only propoſe to exhibit an outline of the ſubject; and we muſt refer our readers to thoſe eminent authors who have treated it in detail. Varignon, in the Memoirs of the French Academy for 1706, has been at immenſe pains to preſent it in every form; James Bernoulli has alſo treated the ſubject in a very general and ſyſtematic manner. Some account is given of it in every treatiſe of fluxions. We recommend the original work of Mr Huyghens in particular; and do not heſitate to ſay, that it is the fineſt ſpecimen (of its extent) of phyſico-mathematical diſcuſſion that ever has appeared. Huyghens was the moſt elegant of all modern geometers; and both in the geometrical and phyſical part of this work, *De Horologio Oſcillatorio,* he has preſerved the utmoſt rigour of demonſtration, without taking one ſtep in which Euclid or Apollonius would not have followed him.

> ———— *juvat integros accedere fontes*
> *Atque haurire.*

Such authors form the taſte of the young mathematician, and help to preſerve him from the almoſt mechanical procedure of the expert ſymbolical analyſt, who arrives at his concluſion without knowing how he gets thither, or having any notions at all of the magnitudes of which he is treating.

There are two principal problems in this doctrine.

I. To aſcertain the nature of the figure generated by the evolution of a given curve.

II. To determine the nature of the curve by whoſe evolution a given curve may be generated.—We ſhall conſider each of theſe in order, and then take the opportunity which this ſubject gives of explaining a little the abſtruſe nature of curvature, and its meaſures and variations, and take notice of the opinions of mathematicians about the preciſe nature of the angle of contact.

Plate xxxii.

The curve line ABCDEF (fig. 1.) may be conſidered as the edge of a crooked ruler or mould; a thread may be ſuppoſed attached to it at F, and then lapped along it from F to A. If the thread be now led away from A, keeping it always tight, it is plain that the extremity A muſt deſcribe a curve line $A\,b\,c\,d\,e\,f$, and that the detached parts of the thread will always be tangents to the curve ABCDEF. In like manner will the curve line $F\,d'\,c'\,b'\,A'$ be deſcribed by keeping the thread faſt at A, and unlapping it from the other end of the mould.

This proceſs was called by Mr Huyghens the Evolution of the curve ADF. ADF is called the Evolute. $A\,d\,f$ was named by him the Curve by Evolution. It has been ſince more briefly termed the Evolutrix, or unlapper. It has alſo been called the Involute; becauſe, by performing the proceſs in the oppoſite direction $f\,d\,A$, the thread is lapped up on the mould, and the whole ſpace $ADF\,f\,d\,A$ is folded up like a fan. The detached parts $C\,c$, $D\,d$, or $C\,c'$, $D\,d'$, &c. of the thread, are called Radii of the Evolute; perhaps with ſome impropriety, becauſe they rather reſemble the momentary radii of the evolutrix. We may name them the evolved radii. The beginning A of evolution may be conſidered as the vertex of the curves, and the ends F and f may be called the terms.

There is another way in which this deſcription of curve lines may be conceived. Inſtead of a thread $F\,f$ gradually lapped up on the mould, we may conceive $F\,f$ to be a ſtraight edged ruler applied to the mould, and gradually rolled along it without ſliding, ſo as to touch it in ſucceſſion in all its points. It is evident, that by this proceſs the point f will deſcribe the curve $f\,d\,A$, while the point F deſcribes the other curve $F\,d'\,a'$. This way of conceiving it gives a great extenſion to the doctrine, and homologates it with that geneſis of curve lines by which cycloids of all kinds are deſcribed, and which we may diſtinguiſh by the name of Provolution. For it is plain, that the relative motions of the points A and b are the ſame, whether the ruler $b\,B\,b'$ roll on the mould ABF, or the mould roll on the ruler: but there will be a great difference in the form of the line traced by the deſcribing point, if we ſuppoſe the plane on which it is traced to be attached to the rolling figure. Thus, when a circle rolls on a ſtraight line, a point in its circumference traces a cycloid on the plane attached to the ſtraight line, while the point of the ſtraight line which quitted the circle deſcribes on the plane attached to the circle another line; namely, the involute of the circle. This mode of deſcription allows us to employ a curved ruler in place of the ſtraight one bBb'; and thus gives a vaſt extenſion to the theory. But at preſent we ſhall confine ourſelves to the employment of the ſtraight line bBb', only keeping in mind, that there is an intimate connection between the lines of evolution and of provolution.

By the deſcription now given of this proceſs of evolution and involution, it is plain,

1. That the evolution is always made from the convex ſide of the evolute.

2. That the evolved radii Bb, Cc, Dd, &c. are reſpectively equal to the arches BA, CA, DA, &c. of the evolute which they have quitted; and that bBb', cCc', dDd, &c. are always equal to the whole arch ADF.

3. That any point B of the lapped up thread deſcribes during its evolution a curve line $B\gamma\delta\epsilon\phi$ parallel to $bcdef$; becauſe theſe curves are always equidiſtant from each other.

4. That if the thread extend beyond the mould as a tangent to it, the extremity α will deſcribe a parallel or equidiſtant curve $\alpha\beta\gamma\delta\epsilon\phi$, lying without $Abcdef$. From this it appears that $B\gamma\delta\epsilon\phi$ is the complete evolutrix of FEDCB, while $bdcef$ is the evolutrix of that arch, and the added tangent Bb. In like manner, the lapped up thread ADF, with the added part $F\phi'$, deſcribes the evolutrix $\phi'\epsilon'\delta'\gamma'\beta'A'$.

5. If from any point C of the evolute there be drawn lines Cb, Cc, Cd, Ce, &c. to the evolutrix, thoſe which are more remote from the vertex are greater than thoſe which are nearer. Draw Bb, cC, dD, eE, touching the evolute. Cb is leſs than $CB + Bb$; that is (2), than Cc. Again, $DC + Cc$ is equal to Dd, which is leſs than $DC + Cd$. Therefore Cc is leſs than Cd. Now let Ce cut Dd in r. Then $er + rDE$ is greater than eE. But eE is equal to $dr + rDE$. Therefore er is greater than dr; and $er + rC$ is greater than $dr + rC$, which is greater than cC. Therefore eC is greater than cC.

6. Hence it follows, that a circle deſcribed round any point of the evolute, with a radius reaching to any point of the evolutrix, will cut the evolutrix in that point, and be wholly within it on the ſide remote from the vertex, and without it on the ſide next the vertex.

7. The evolved radius cuts every arch of the evolutrix perpendicularly, or a right line drawn through the interſection at right angles touches the evolutrix in that point. Through any point d draw the line mdt at right angles to dD. The part of it md next to the vertex is wholly without the curve, becauſe it is without the circle deſcribed round the centre D; and this circle is without the evolutrix on that ſide of d which is next the vertex (6). Any point t on the other ſide of d is alſo without the curve. For let teE be another evolved radius, cutting Dd in n: then nd is leſs than nt, becauſe ndt is a right angle by conſtruction; and therefore ntd is acute. But becauſe $En + nD$ are greater than ED, $En + nd$ are greater than $ED + Dd$, that is, than Ee, and nd is greater than ne. Therefore, ſince it is leſs than nt, it follows that ne is much leſs than nt, and t lies without the curve. Therefore the whole line mdt is without the curve, except in the point d. It therefore touches the curve in d, and the radius Dd cuts it at right angles in that point. By the ſame reaſoning, it is demonſtrated, that all the curves $Abdf$, $\alpha\beta\delta\phi$, $A'b'd'f'$, $\alpha'\beta'\delta'\phi'$, are cut perpendicularly by the tangents to the evolute. Alſo all theſe curves interſect the evolute at right angles in their vertexes.

It follows from this propoſition, that from every point, ſuch as s, or i, or o, &c. in the ſpace AOF comprehended by the evolute and its extreme tangents AO, FO, two perpendiculars may be drawn to the evolutrix Adf; and that from any point in the ſpace within the angle Aof only one perpendicular can be drawn; and that no perpendicular can be drawn from any point on the other ſide of ADF. Apollonius had obſerved theſe circumſtances in the conic ſections, but had not thought of marking the boundary formed by the evolute ADE. Had he noticed this, he would certainly have diſcovered the whole theory of evolution, and its importance in ſpeculative geometry.

It alſo follows from this propoſition, that if a curve $Abcdef$ is cut by the tangents of ABCDEF at right angles in every point, it will be deſcribed by the evolution of that curve: For if the evolutrix, whoſe vertex is A, be really deſcribed, it will coincide with $Abcd$ in A, and have the ſame tangent; it therefore does not deviate from it, otherwiſe their tangents would ſeparate, and would not both be at right angles with the lines touching the evolute. They muſt therefore coincide throughout.

8. The arches bcd and $\beta\gamma\delta$, intercepted by the ſame radii Bb and Dd, may be called *concentric;* and the angles contained between the tangents drawn through their extremities are equal. Thus the angle $\lambda\varpi o$ is equal to lpo: but although equidiſtant, parallel, and containing the ſame angle between their tangents and between their radii, they are not ſimilar. Thus, the arch $\alpha\beta$ has a curvature at α that is the ſame with that of any circle whoſe radius is equal to $A\alpha$; but the curvature at A is incomparable with it, and unmeaſurable. The ſame may be ſaid of the curvature δ at β and at B.

9. If a circle udz be deſcribed round the centre D with the radius Dd, it both touches and cuts the evolutrix in the point d, and no circle can be deſcribed touching the curve in that point, and paſſing between it and the circle udz; For ſince it touches the curve in d, its centre muſt be ſomewhere in the line dD perpendicular to mdt. It cannot be in any point n more remote from d than D is; for it would paſs without the arch du, and be more remote than du from the arch dc of the evolutrix. On the other ſide, it would indeed paſs without the arch dz, which lies within the arch de of the evolutrix: but it would alſo paſs without the curve. For it has been already demonſtrated (7) that nd is greater than ne; and the curve would lie between it and the circle dz.

Thus it appears, that a circle deſcribed with the evolved radius approaches nearer to the curve, or touches it more cloſely, than any other circle; all other circles either interſect it in meaſurable angles, or are within or without the curve on both ſides of the point of contact. This circle udz has therefore the ſame curvature

ture with the curve in the point of contact and coaleſcence. It is the EQUICURVE CIRCLE, the circle of equal curvature, the OSCULATING CIRCLE (a name given it by Leibnitz). The evolved radius of the evolute is the RADIUS OF CURVATURE of the evolutrix, and the point of the evolute is the CENTRE OF CURVATURE at the point of contact with the evolutrix. The evolute is the geometrical locus of all the centres of curvature of the evolutrix.

This is the moſt important circumſtance of the whole doctrine of the involution and evolution of curve lines. It is aſſumed as a ſelf-evident truth by the precipitant writers of elements. It is indeed very like truth: For the extremity of the thread is a momentary radius during the proceſs of evolution; and any minute arch of the evolute nearer the vertex muſt be conceived as more incurvated than the arch at the point of contact, becauſe deſcribed with ſhorter radii: for the ſame reaſon, all beyond the contact muſt be leſs incurvated, by reaſon of the greater radii. The curvature at the contact muſt be neither greater nor leſs than that of the circle. But we thought it better to follow the example of Huyghens, and to eſtabliſh this leading propoſition on the ſtricteſt geometrical reaſoning, acknowledging the ſingular obligation which mathematicians are under to him for giving them ſo palpable a method of fixing their notions on this ſubject. When the evolute of a curve is given, we have not only a clear view of the geneſis of the curve, with a neat and accurate mechanical method of deſcribing it, but alſo a diſtinct comprehenſion of the whole curvature, and a connected view of its gradual variations.

We ſpeak of curvature that is greater and leſſer; and every perſon has a general knowledge or conception of the difference, and will ſay, that an ellipſis is more curve at the extremities of the tranſverſe axis than any where elſe. But before we can inſtitute a compariſon between them with a preciſion that leads to any thing, we muſt agree about a meaſure of curvature, and ſay what it is we mean by a double or a triple curvature.

Now there are two ways in which we may conſider curvature, or a want of rectitude: We may call that a double curvature which, in a given ſpace, carries us twice as far from the ſtraight line; or we may call that a double curvature by which we deviate twice as much from the ſame direction. Both of theſe meaſures have been adopted; and if we would rigidly adhere to them, there would be no room for complaint: but mathematicians have not been ſteady in this reſpect, and by mixing and confounding theſe meaſures, have frequently puzzled their readers. All agree, however, in their firſt and ſimple meaſures of curvature, and ſay, that the curvature of an arch of a circle is as the arch directly, and as the radius inverſely. This is plainly meaſuring curvature by the deflection from the firſt direction. In an arch of an inch long, there is twice as much deflection from the firſt direction when the radius of the circle is of half the length. If the radius is about 57¼th inches, an arch of one inch in length produces a final direction one degree different from the firſt. If the radius is 114½ inches, the deviation is but half of a degree. The linear deflection from the ſtraight path is alſo one-half. In the caſe of circles, therefore, both meaſures agree: but in by far the greateſt number of caſes they may differ exceedingly, and the change of direction may be greateſt when the linear deviation is leaſt. Flexure, or change of direction, is, in general, the moſt ſenſible and the moſt important character of curvature, and is underſtood to be its criterion in all caſes. But our proceſſes for diſcovering its quantity are generally by firſt diſcovering the linear deviation; and, in many caſes, particularly in our philoſophical inquiries, this linear deviation is our principal object. Hence it has happened, that the mathematician has frequently ſtopped ſhort at this reſult, and has adapted his theorems chiefly to this determination. Theſe differences of object have cauſed great confuſion in the methods of conſidering curvature, and led to many diſputes about its nature, and about the angle of contact; to which diſputes there will be no end, till mathematicians have agreed in their manner of expreſſing the meaſures of curvature. At preſent we abide by the meaſure already given, and we mean to expreſs by curvature or flexure the change of direction.

This being premiſed, we obſerve, that the curvature of all theſe curves of evolution where they ſeparate from their evolutes, is incomparable with the curvature in any other place. In this point the radius has no magnitude; and therefore the curvature is ſaid to be infinitely great. On the other hand, if the evolved curve has an aſſymptote, the curvature of the evolutrix of the adjacent branch is ſaid to be infinitely ſmall. Theſe expreſſions becoming familiar, have occaſioned ſome very intricate queſtions and erroneous notions. There can be little doubt of their impropriety: For when we ſay, that the curvature at A is infinitely greater than at α, we do not recollect that the flexure of the whole arch A *b* is equal to that of the whole arch $\alpha\,\beta$, and the flexure at A muſt either make a part of the whole flexure, or it muſt be ſomething diſparate.

The evolutrix A*bcdf* (fig. 2.) of the common equilateral hyperbola exhibits every poſſible magnitude of curvature in a very ſmall ſpace. At the vertex A of the hyperbola it is perpendicular to the curve; and therefore has the tranſverſe axis A φ A″ for its tangent. The curvature of the evolutrix at A is called infinitely great. As the thread unlaps from the branch ABC, its extremity deſcribes A *b c*. It is plain, that the evolutrix muſt cut the aſſymptote φ H at right angles in ſome point G, where the curvature will be what is called infinitely ſmall; becauſe the centre of curvature has removed to an infinite diſtance along the branch AF of the hyperbola. This evolutrix may be continued to the vertex of the hyperbola on the other ſide of the aſſymptote, by cauſing the thread to lap upon it, in the ſame way that Mr Huyghens completed his cycloidal oſcillation. Or we may form another evolutrix $\alpha\,\beta\,\gamma\,\delta\,\varphi\,\nu'\,\delta'\,\beta'$ A″, by lengthening the thread from G to φ, the centre of the hyperbola, and ſuppoſing that, as ſoon as the curve A $\delta\,\varphi$ is completed, by unlapping the thread from the branch ABC, another thread laps upon the hyperbola A″ F″. This laſt is conſidered as a more geometrical evolution than the other: For the mathematicians, extending the doctrine of evolution beyond Mr Huyghens's reſtriction to curves which had their convexity turned one way, have agreed to conſider as one continued evolution whatever will complete the curve expreſſed by one equation. Now the ſame equation expreſſes both the curves AF and A″F″, which occupy the ſame axis AA″. The cycloid employed by

Huyghens is, in like manner, but one continuous curve, deſcribed by the continued provolution of the circle along the ſtraight line, although it appears as two branches of a *repeated* curve. We ſhall meet with many inſtances of this ſeemingly compounded evolution when treating of the ſecond queſtion.

Since the arch A*bd*G contains every magnitude of curvature, it appears that every kind of curvature may be produced by evolution. We can have no conception of a flexure that is greater than what we ſee at A, or leſs than what we ſee at G; yet there are caſes which ſeem to ſhew the contrary, and are familiarly ſaid, by the greateſt mathematicians, to exhibit curvatures infinitely ſmaller ſtill. Thus, let ABC (fig. 3.) be a conical parabola, whoſe parameter is AP. Let AEF be a cubical parabola, whoſe parameter is AQ. If we make AQ to AD as the cube of AP to the cube of AQ, the two parabolas will interſect each other in the ordinate DB. For, making AP $= p$, and AQ $= q$, and calling the ordinate of the conic parabola y, that of the cubic parabola z, and the indeterminate abſciſſa AD x, we have

$$p^3 : q^3 = q : x, = q^3 : z^3, \text{ and } p : q = q : z;$$

but $q : p = q : p$; therefore, by compoſition,

$$p^2 : q^2 = q^2 : px = q^2 : y^2, \text{ and } p : q = q : y;$$

therefore $z = y$, and the parabolas interſect in B.

Now, becauſe in all parabolas the ordinates drawn at the extremity of the parameters are equal to the parameters, the interſections q and p will be in a line Aqp, which makes half a right angle with the axis AP. Therefore, when AQ is greater than AP, the point q is without the conical parabola, and the whole arch of the cubical parabola cut off by the ordinate DB is alſo without it: but when AQ is leſs than AP, q is within the conical parabola, as is alſo the arch qB. Therefore the remaining arch BEA is without it, and is therefore leſs incurvated at A. An endleſs number of conical parabolas of ſmaller curvature may be drawn by enlarging AP; yet there will ſtill be an arch AEB of the cubical parabola which is without it, and therefore leſs incurvated. Therefore the curvature of a cubical parabola is leſs than that of any conical parabola: It is ſaid to be infinitely leſs, becauſe an infinity of cubical parabolas of *ſmaller curvature* than AEB may be drawn by enlarging AQ.

It may be demonſtrated in the ſame manner, that a paraboloid, whoſe ordinates are in the ſubbiquadrate ratio of the abſciſſæ, has an infinitely ſmaller curvature at the vertex than the cubical parabola. And the curvature of the paraboloid of the next degree is infinitely leſs than this: and ſo on continually. Nay, Sir Iſaac Newton, who firſt took notice of this remarkable circumſtance, demonſtrates the ſame thing of an endleſs ſucceſſion of paraboloids interpoſed between any two degrees of this ſeries. *Neque novit* (ſays he) *natura limitem.*

If this be the caſe, all curves cannot be deſcribed by evolution; for we have no conception of a radius of curvature that is greater than a line without limit. The theory of curvilineal motions delivered in the article Dynamics muſt be imperfect, or there muſt be curve lines which bodies cannot deſcribe by any powers of nature. The theory there delivered profeſſes to teach how a body can be made to deſcribe the cubical parabola, and many other curves which have theſe infiniteſimal curvatures; and yet its demonſtrations employ the radius of curvature, and cannot proceed without it. We profeſs ourſelves obliged to an attentive reader (who has not favoured us with his name) for making this obſervation. It merits attention.

There muſt be ſome paralogiſm or miſconception in all this language of the mathematicians. It does not neceſſarily follow from the arch AEB lying without the arch AIB, that it is leſs incurvated at A; it may be more incurvated between A and B. Accordingly we ſee, that the tangent BT of the conical parabola is leſs inclined to the common tangent AV than the tangent B*t* of the cubical parabola is; and therefore the flexure of the whole arch AEB is greater than that of the whole arch AIB; and we ſhall ſee afterwards, that there is a part of AEB that is more incurvated than any part of AIB. There is nothing correſponding to this unmeaning and inconceivable ſucceſſion of ſerieſes of magnitudes of one kind, each of which contains an endleſs variety of individuals, and the greateſt of one ſeries infinitely leſs than the ſmalleſt of the next, &c.; there is nothing like this demonſtrated by all our arguments. In none of theſe do we ever treat of the curvature at A, But of a curvature which is *not* at A. At A we have none of the lines which are indiſpenſably neceſſary for the demonſtration. Beſides, in the very ſame manner that we can deſcribe a cubical parabola, and prove that it has an arch lying without the conical parabola, we can deſcribe a circle, and demonſtrate that it has alſo an arch lying without the parabola. Theſe infiniteſimal curvatures, therefore, are not warranted by our arguments, nor does it yet appear that there are curves which cannot be deſcribed by evolution. We are always puzzled when we ſpeak of infinites and infiniteſimals as of ſomething preciſe and determinate; whereas the very denomination precludes all determination. We take the diſtinguiſhing circumſtance of thoſe different orders for a thing clearly underſtood; for we build much on the diſtinction. We conceive the curvature of the cubical parabola as verging on that of the common parabola, and the one ſeries of curvatures as beginning where the other ends. But Newton has ſhewn, that between theſe two ſerieſes an endleſs number of ſimilar ſerieſes may be interpoſed. The very names given to the curvature at the extremities of the hyperbolic evolutrix have no conceptions annexed to them. At the vertex of the hyperbola there is no line, and at the interſection with the aſſymptote there is no curvature. Theſe unguarded expreſſions, therefore, ſhould not make us doubt whether all curves may be deſcribed by evolution. If a line be incurvated, it is not ſtraight. If ſo, two perpendiculars to it muſt diverge on one ſide, and muſt converge and meet on the other in ſome point. This point will lie between two other points, in which the two perpendiculars touch that curve by the evolution, of which the given arch of the curve may be deſcribed. Finally (which ſhould decide the queſtion), we ſhall ſee by and bye, that the cubic, and all higher orders of paraboloids, may be ſo deſcribed by evolution from curves having aſſymptotic branches of determinable forms.

Such are the general affections of lines generated by evolution. They are not, properly ſpeaking, peculiar properties; for the evolutrixes may be any curve lines whatever. They only ſerve to mark the mutual relations of the evolutes with their evolutrixes, and enable us to conſtruct the one, and to diſcover its properties by means of our knowledge of the other. We proceed to ſhew how the properties of the evolutrix may be determined by our knowledge of the evolute.

This problem will not long occupy attention, being much limited by the conditions. One of the firſt is, that the length of the thread evolved muſt be known in every poſition: Therefore the length of the evolved arch muſt, in like manner, be known; and this, not only *in toto*, but every portion of it. Now this is not univerſally, or even generally the caſe. The length of a circular, parabolic, hyperbolic, arch has not yet been determined by any finite equation, or geometrical conſtruction. Therefore their evolutrixes cannot be determined otherwiſe than by approximation, or by compariſon with other magnitudes equally undetermined. Yet it ſometimes happens, that a curve is diſcovered to evolve into another of known properties, although we have not previouſly diſcovered the length of the evolved arch. Such a diſcovery evidently brings along with it the rectification of the evolute. Of this we have an inſtance in the very evolution which gave occaſion to the whole of this doctrine; namely, that of the cycloid; which we ſhall therefore take as our firſt example.

Let ABC (fig. 5.) be a cycloid, of which AD is the axis, and AHD the generating circle, and AG a tangent to the cycloid at A, and equal to DC. Let BKE touch the cycloid in B, and cut AG in K. It is required to find the ſituation of that point of the line BE which had unfolded from A?

Draw BH parallel to the baſe DC of the cycloid, cutting the generating circle in H, and join HA. Deſcribe a circle KEM equal to the generating circle AHD, touching AG in K, and cutting BK in ſome point E. It is known, by the properties of the cycloid, that BK is equal and parallel to HA, and that BH is equal to the arch A *h* H. Becauſe the circles AHD and KEM are equal, and the angles HAK and AKE are equal, the chords AH and KE cut off equal arches, and are themſelves equal. Becauſe BHAK is a parallelogram, AK is equal to HB; that is, to the arch A *h* H, that is, to the arch K *m* E. But if the circle KEM had been placed on A, and had rolled from A to K, the arch diſengaged would have been equal to AK, and the point which was in contact with A would now be in E, in the circumference of a cycloid AEF, equal to CBA, having the line AG, equal and parallel to DC, for its baſe, and GF, equal and parallel to DA, for its axis. And if the diameter KM be drawn, and EM be joined, EM touches the cycloid AEF.

Cor. The arch BA of the cycloid is equal to twice the parallel chord HA of the generating circle: For this arch is equal to the evolved line BKE; and it has been ſhewn, that EK is equal to KB, and BE is therefore equal to twice BK, or to twice HA. This property had indeed been demonſtrated before by Sir Chriſtopher Wren, quite independent of the doctrine of evolution; but it is given here as a legitimate reſult of this doctrine, and an example of the uſe which may be made of it. Whenever a curve can be evolved into another which is ſuſceptible of accurate determination, the arch of the evolved curve is determined in length; for it always makes a part of the thread whoſe extremity deſcribes the evolutrix, and its length is found, by taking from the whole length of the thread that part which only touches the curve at its vertex.

This geneſis of the cycloid AEF, by evolution of the cycloid ABC, alſo gives the moſt palpable and ſatisfactory determination of the area of the cycloid. For ſince BE is always parallel to AH, AH will ſweep over the whole ſurface of the ſemicircle AHD, while BE ſweeps over the whole ſpace CBAEF; and ſince BE is always double of the ſimultaneous AH, the ſpace CBAEF is quadruple of the ſemicircle AHD. But the ſpace deſcribed in any moment by BK is alſo one fourth part of that deſcribed by BE. Therefore the area GAEF is three times the ſemicircle AHD; and the ſpace DHABC is double of it; and the ſpace CBAG is equal to it.

Sir Iſaac Newton has extended this remarkable property of evolving into another curve of the ſame kind to the whole claſs of epicycloids, that is, cycloids formed by a point in the circumference of a circle, while the circle rolls on the circumference of another circle, either on the convex or concave ſide; and he has demonſtrated, that they alſo may all be rectified, and a ſpace aſſigned which is equal to their area (See *Principia*, B. I. prop. 48. &c.). He demonſtrates, that the whole arch is to four times the diameter of the generating circle as the radius of the baſe is to the ſum or difference of thoſe of the baſe and the generating circle. We recommend theſe propoſitions to the attention of the young reader who wiſhes to form a good taſte in mathematical reſearches; he will there ſee the geometrical principles of evolution elegantly exemplified.

We may juſt obſerve, before quitting this claſs of curves, that many writers, even of ſome eminence, in their compilations of elements, give a very faulty proof of the poſition of the tangent of a curve deſcribed by rolling. They ſay, for example, that the tangent of the cycloid at E is perpendicular to KE; becauſe the line KE is, at the moment of deſcription, turning round K as a momentary centre. This, to be ſure, greatly ſhortens inveſtigation; and the inference is a truth, not only when the rolling figure is a circle rolling on a ſtraight line, but even when any one figure rolls on another. Every point of the rolling figure really *begins* to move perpendicularly to the line joining it with the point of contact. But this geneſis of the arch E *e*, by the evolution of the arch B *b*, ſhews that K is by no means the centre of motion, nor HK the radius of curvature. Nor is it, in the caſe of epicycloids, trochoids, and many curves of this kind, a very eaſy matter to find the momentary centre. The circle KEM is both advancing and turning round its centre; and theſe two motions are equal, becauſe the circle does not ſlide but roll, the detached arch being always equal to the portion of the baſe which it quits. Therefore, drawing the tangents E *g*, M *g*, and completing the parallelogram E *f* M *g*, E *f* will repreſent the progreſſive motion of the centre, and E *g* the motion of rotation. EM, the motion compounded of theſe, muſt be perpendicular to the chord EK.

The inveſtigation that we have given of the evolutrix of the cycloid has been ſomewhat peculiar, being that which offered itſelf to Mr Huyghens at the time when he and many other eminent mathematicians were much occupied with the ſingular properties of this curve. It does not ſerve, however, ſo well for exemplifying the general proceſs. For this purpoſe, it is proper to avail ourſelves of all that we know of the cycloid, and particularly the equality of its arch BA to the double of the parallel chord HA. This being known, nothing can be more ſimple than the determination of the evolutrix, either by availing ourſelves of every property of the cycloid, or by adhering to the general proceſs of referring every point to an abſciſſa by means of perpendicular ordinates. In the firſt method, knowing that BE is double of BK, and therefore KE equal to HA, and $KA = BH, = H\,b\,A, = K\,m\,E$, we find E to be the deſcribing point of the circle, which has rolled from A to K. In the other method, we muſt draw EN perpendicular to AG; then, becauſe the point E moves, during evolution, at right angles to BE, EK is the normal to the curve deſcribed, and NK the ſubnormal, and is equal to the correſponding ordinate H′ I′ of the generating circle of the cycloid ABC. This being a characteriſtic property of a cycloid, E is a point in the circumference of a cycloid equal to the cycloid ABC.

Or, laſtly, in accommodation to caſes where we are ſuppoſed to know few of the properties of the evolute, or, at leaſt, not to attend to them, we may make uſe of the fluxionary equation of the evolute to obtain the fluxionary equation of the evolutrix. For this purpoſe, take a point *e* very near to E, and draw the evolving radius *b e*, cutting E *f* (drawn parallel to the baſe DC) in *o*; draw *e n* parallel to the axis of the evolute, cutting E *o* in *v*; alſo draw *b h i* parallel to the baſe, and B *d* perpendicular to it. If both curves be now referred to the ſame axis CGF, it is plain that B *b*, B *d*, and *d b* are ultimately as the fluxions of the arch, abſciſs, and ordinate of the evolute, and that E *e*, *e v*, and *v* E, are ultimately as the fluxions of the arch, abſciſſa, and ordinate of the evolutrix. Alſo the two fluxionary triangles are ſimilar, the ſides of the one being perpendicular, reſpectively, to thoſe of the other. If both are referred to one axis, or to parallel axes, the fluxion of the abſciſſa of the evolute is to that of its ordinate, as the fluxion of the ordinate of the evolutrix is to that of its abſciſſa. Thus, from the fluxionary equation of the one, that of the other may be obtained. In the preſent caſe, they may be referred to AD and FG, making CG equal to the cycloidal arch CBA. Call this *a*; AI, *x*; IB, *y*; and AB, or EB, *z*. In like manner, let F *t* be $= u$, *t* E $= v$, and FE $= w$; then, becauſe $DH^2 = DA^2 - AH^2$, and DA and AH are the halves of CF and BE, we have $DH^2 = \frac{a^2 - z^2}{4}$. Alſo $DI = \frac{DH^2}{DA} = \frac{a^2 - z^2}{4 \times \frac{1}{2} a}, = \frac{a^2 - z^2}{2\,a}$. But DI $=$ F *t*. Therefore F *t*, or *u*, $= \frac{a^2 - z^2}{2\,a}$. Alſo $w = \frac{\dot{u}\,\dot{z}}{\dot{y}}$, by what was ſaid above, that is, $\dot{w} = \frac{a\,\dot{u}}{\sqrt{a^2 - z^2}}, = \frac{a\,\dot{u}}{\sqrt{2\,a\,u}}$. Therefore we have $\dot{w} : \dot{u}\ (= a : \sqrt{2\,a\,u}) = \sqrt{\tfrac{1}{2} a} : \sqrt{u} = \sqrt{GF} : \sqrt{F\,t}$, which is the analogy competent to a cycloid whoſe axis is $GF = DA$.

It is not neceſſary to inſiſt longer on this in this place; becauſe all theſe things will come more naturally before us when we are employed in deducing the evolute from its evolutrix.

When the ordinates of a curve converge to a centre, in which caſe it is called a radiated curve, it is moſt convenient to conſider its evolutrix in the ſame way, conceiving the ordinates of both as inſiſting on the circumference of a circle deſcribed round the ſame centre. Spirals evolve into other ſpirals, and exhibit ſeveral properties which afford agreeable occupation to the curious geometer. The equiangular, logarithmic, or loxodromic ſpiral, is a very remarkable example. Like the cycloid, it evolves into another equal and ſimilar equiangular ſpiral, and is itſelf the evolutrix of a third. This is evident on the ſlighteſt inſpection. Let C *r q p* (fig. 6.) be an equiangular ſpiral, of which S is the centre; if a radius SC be drawn to any point C, and another radius SP be drawn at right angles to it, the intercepted tangent CP is known to be equal to the whole length of the interior revolutions of the ſpiral, though infinite in number. If the thread CP be now unlapped from the arch C *r q*, it is plain that the firſt motion of the point P is in a direction PT, which is perpendicular to PC, and therefore cuts the radius PS in an angle SPT, equal to the angle SCP; and, ſince this is the caſe in every poſition of the point, it is manifeſt that its path muſt be a ſpiral PQR, cutting the radii in the ſame angle as the ſpiral C *r q p*. James Bernoulli firſt diſcovered this remarkable property. He alſo remarked, that if a line PH be drawn from every point of the ſpiral, making an angle with the tangent equal to that made by the radius (like an angle of reflection correſponding with the incident ray SP), thoſe reflected rays would all be tangents to another ſimilar and equal ſpiral I *v* H: ſo that PH $=$ PS. S and H are conjugate foci of an infinitely ſlender pencil; and therefore the ſpiral I *v* H is the cauſtic by reflection of RQP for rays flowing from S. If another equal and ſimilar ſpiral *x v y* roll on I *v* H, its centre *z* will deſcribe the ſame ſpiral in another poſition *w u z*. All theſe things flow from the principles of evolution alone: and Mr Bernoulli traces, with great ingenuity, the connection and dependence of cauſtics, both by reflection and refraction, of cycloidal, and all curves of provolution, and their origin in evolution or involution. A variety of ſuch repetitions of this curve (and many other ſingular properties), made him call it the SPIRA MIRABILIS. He deſired that it ſhould be engraved on his tombſtone, with the inſcription EADEM MUTATA RESURGO, as expreſſive of the reſurrection of the dead. See his two excellent diſſertations in *Act.* Erudit. 1692, March and May.

Another remarkable property of this ſpiral is, that if, inſtead of the thread evolving from the ſpiral, the ſpiral evolve from the ſtraight line PC, the centre S will deſcribe the ſtraight line PS. Of this we have an example in the apparatus exhibited in courſes of experimental philoſophy, in which a double cone deſcends, by rolling along two rulers inclined in an angle to each other (ſee *Graveſande's* Nat. Phil. I. § 210). It is pretty remarkable, that a rolling motion, ſeemingly round C, as a momentary centre, ſhould produce a motion in the ſtraight line SP; and it ſhews the inconcluſiveneſs of the reaſoning, by which many compilers of elements of geometry profeſs to demonſtrate, that the motion of the deſcribing point S is perpendicular to the momentary radius. For here, although this ſeeming momentary radius may be ſhorter than any line that can be named, the real radius of curvature is longer than any line that can be named.

But it is not merely an object of ſpeculative geometric curioſity to mark the intimate relation between the geneſis of curves by evolution and provolution; it may be applied to important purpoſes both in ſcience and in art. Mr M'Laurin has given a very inviting example of this in his account of the Newtonian philoſophy; where he exhibits the moon's path in abſolute ſpace, and from this propoſes to inveſtigate the deflecting forces, and *vice verſa.* We have examples of it in the arts, in the formation of the pallets of pendulums, the teeth of wheels, and a remarkable one in Meſſrs Watt and Boulton's ingenious contrivance for producing the rectilineal motion of a piſton rod by the combination of circular motions. M. de la Hire, of the Academy of Sciences at Paris, has been at great pains to ſhew how all motions of evolution may be converted into motions of provolution, in a memoir in 1706. But he would have done a real ſervice, if, inſtead of this ingenious whim, he had ſhewn how all motions of provolution may be traced up to the evolution which is equivalent to them. For there is no organic geneſis of a curvilineal motion ſo ſimple as the evolution of a thread from a curve. It is the primitive geneſis of a circle; and it is in evolution alone that any curvilineal motion is comparable with circular motion. A given curve line is an individual, and therefore its primitive organical geneſis muſt alſo be individual. This is ſtrictly true of evolution. A parabola has but one evolute. But there are infinite motions of provolution which will deſcribe a parabola, or any curve line whatever; therefore theſe are not primitive organical modes of deſcription. That this, however, is the caſe, may be very eaſily ſhewn. Thus let ABCD (fig. 7.) be a parabola, or any curve; and let *a b c d* be any other curve whatever. A figure E *m l k h i* may be found ſuch, that while it rolls along the curve *a b c d*, a point in it ſhall deſcribe the parabola. The proceſs is as follows: Let B *b*, C *c*, D *d*, &c. be a number of perpendiculars to the parabola, cutting the curve *a b c d* in ſo many points. The perpendiculars may be ſo diſpoſed that the points *a*, *b*, *c*, &c. ſhall be equidiſtant. Now we can conſtruct a triangle E *e h* ſo, that the three ſides E *e*, *eh*, and *h* E, ſhall be reſpectively equal to the three lines E *e*, *ef*, F *f*. In like manner may the whole figure be conſtructed, having the little baſes of the triangles reſpectively equal to the ſucceſſive portions of the baſe A *b c d*, and the radii equal to the perpendiculars B *b*, C *c*, D *d*, &c. Let this figure roll on this baſe *c*. While the little ſide *e k* moves from its preſent poſition, and applies itſelf to *e f*, the point E deſcribes an arch E ε of a circle round the centre *e*, and, falling within the parabola, is ſomewhere between E and F. Then continuing the provolution, while the next ſide *h i* turns round *f* till *i* applies to *g*, the point E deſcribes another arch ε F *o* round *f*, firſt riſing up and reaching the parabola in F, when the line *h* E coincides with *f* F, and then falling within the parabola till the point *h* begin to riſe again from *f* by the turning of the rolling figure round the point *g*. Reverſing the motion, the ſides *i h*, *h e*, *e k*, &c. apply themſelves in ſucceſſion to the portions *g f*, *f e*, *e d*, &c. of the baſe, and the point E deſcribes an undulating line, conſiſting of arches of circles round the ſucceſſive centres *g*, *f*, *e*, &c. Theſe circular arches all touch the parabola in the points G, F, E, &c. and ſeparate from it a little internally. By diminiſhing the portions of the baſe, and increaſing the number of the triangular elements of the rolling figure without end, it is evident that the figure becomes ultimately curvilineal inſtead of polygonal, and the point E continues in the parabola, and accurately deſcribes it. It is now a curvilineal figure, having its elementary arches equal to the portions of the baſe to which they apply in ſucceſſion, and the radii converging to E equal to the perpendiculars intercepted between the curve ABCD and the baſe. It may therefore be accurately conſtructed.

It is clear, that practical mechanics may derive great advantage from a careful ſtudy of this ſubject. We now ſee motions executed by machinery which imitate almoſt every animal motion. But theſe have been the reſult of many random trials of *wipers*, *ſnail-pieces*, &c. of various kinds, repeatedly corrected, till the deſired motion is at laſt accompliſhed. But it is, as we ſee, a ſcientific problem, to conſtruct a figure which ſhall certainly produce the propoſed motion; nor is the proceſs by any means difficult. But how ſimple, in compariſon, is the production of this motion by evolution. We have only to find the curve line which is touched by all the perpendiculars B *b*, C *c*, D *d*, &c. This naturally leads us to the ſecond problem in this doctrine, namely, to determine the evolute by our knowledge of the involute: a problem of greater difficulty and of greater importance, as it implies, and indeed teaches, the curvature of lines, its meaſure, and the law of its variation in all particular caſes. The evolute of a curve is the geometrical expreſſion, and exhibition to the eye, of both theſe affections of curve lines.

Since the evolved thread is always at right angles to the evolutrix and its tangent, and is itſelf always a tangent of the evolute, it follows, that all lines drawn perpendicular to the arch of any curve, touch the curve line which will generate the given curve by evolution. Were this evolved curve previouſly known to us, we could tell the preciſe point where every perpendicular would touch it; but this being unknown, we muſt determine the points of contact by ſome other method, and by this determination we aſcertain ſo many points of the evolute. The method purſued is this: When two perpendiculars to the propoſed curve are not parallel (which we know from the known poſition of the tangents of our curve), they muſt interſect each other ſomewhere on that ſide of the tangents where they contain an angle leſs than 180°. But when they thus interſect, one of them has already touched the evolute, and the other has not yet reached it. Thus let *b s*, *e s* (fig. 1.) be the two perpendiculars: being tangents to the evolute, the point *s* of their interſection muſt be on its convex ſide, and the unknown points of contact B and E muſt be on different ſides of *s*. Theſe are elementary truths.

Let *e* E approach toward *b* B, and now cut it in *x*. The contact has ſhifted from E to D, and *x* is ſtill between the contacts. When the ſhifting perpendicular comes to the poſition *c* C, the interſection is at *i*, between the contacts B and C. And thus we ſee, that as the perpendiculars to the involute gradually approach, their contacts with the evolute alſo approach, and their interſection is always between them. Hence it legitimately follows, that the ultimate poſition of the interſection

ſection (which alone is ſuſceptible of determination by the properties of the involute) is the poſition of the point of contact, and therefore determines a point of the evolute. The problem is therefore reduced to the inveſtigation of this ultimate interſection of two perpendiculars to the propoſed curve, when they coaleſce after gradually approaching. This will be beſt illuſtrated by an example: Therefore let ABC (fig. 8.) be a parabola, of which A is the vertex, AH the axis, and AV one-half of the parameter; let BE and CK be two perpendiculars to the curve, cutting the axis in E and K, and interſecting each other in *r*; draw the ordinates BD, CV, and the tangent BT, and draw BF parallel to the axis, cutting CK in F, and CN in O.

Becauſe the perpendiculars interſect in *r*, we have $r\mathrm{E} : \mathrm{EB} = \mathrm{EK} : \mathrm{BF}$. If therefore we can diſcover the ratio of EK to BF, we determine the interſection *r*. But the ratio of EK to BF is compounded of the ratio of EK to BO, and the ratio of BO to BF. The firſt of theſe is the ratio of equality; for DE and VK are, each of them, equal to AV, or half the parameter. Take away the common part VE, and the remainders EK and DV are equal, and DV is equal to BO; therefore $\mathrm{EK} : \mathrm{BF} = \mathrm{BO} : \mathrm{BF}$; therefore $r\mathrm{E} : r\mathrm{B} = \mathrm{BO} : \mathrm{BF}$, and (by diviſion) $\mathrm{BE} : \mathrm{E}r = \mathrm{FO} : \mathrm{OB}$. Now let the point C continually approach to B, and at laſt unite with it. The interſection *r* will unite with a point of contact N on the evolute. The ultimate ratio of FO to OB, or of $fo : o\mathrm{B}$, is evidently that of ED to DT, or ED to 2DA: therefore $\mathrm{BE} : \mathrm{EN} = \mathrm{ED} : 2\mathrm{DA}$, or as half the parameter to twice the abſciſſa. Thus have we determined a point of the evolute; and we may, in like manner, determine as many as we pleaſe.

But we wiſh to give a general character of this evolute, by referring it to an axis by perpendicular ordinates. It is plain that V is one point of it, becauſe the point E is always diſtant from its ordinate DB by a line equal to AV; and therefore, when B is in A, E will be in V, and *r* will coincide with it. Now draw VP and NQ perpendicular to AH, and NM perpendicular to VP; let EB cut PV in *t*: then, becauſe AV and DE are equal, AD is equal to VE, and VE is equal to one-half of DT. Moreover, becauſe BD and NQ are parallel, $\mathrm{DE} : \mathrm{EQ} = \mathrm{BE} : \mathrm{EN} = \mathrm{DE} : \mathrm{DT}$; therefore $\mathrm{DT} = \mathrm{EQ}$, and $\mathrm{VE} = \frac{1}{2}\mathrm{EQ}$, and therefore $= \frac{1}{3}\mathrm{VQ}$; therefore V*t* is $\frac{1}{3}$ of M*t*, and $\frac{1}{2}$MV. This is a characteriſtic property of the evolute. The ſubtangent is $\frac{3}{2}$ of the abſciſſa; in like manner, as in the common parabola, it is double of the abſciſſa. We know therefore that the evolute is a paraboloid, whoſe equation is $ax^2 = y^3$; that is, the cube of any ordinate MN is equal to the parallelopiped whoſe baſe is the ſquare of the abſciſſa VM, and altitude a certain line VP, called the parameter. To find VP, let CR be the perpendicular to the parabola in the point where it is cut by the ordinate at V; draw the ordinate RS of the paraboloid, and RG perpendicular to AH. Then it is evident, from what has been already demonſtrated, that VK is $\frac{1}{2}$ of KG, and $\frac{1}{3}$ of VG; therefore $\mathrm{KG}^2 = 4\,\mathrm{VK}^2$, and (in the parabola) $\mathrm{VC}^2 = 2\,\mathrm{VK}^2$. Alſo, becauſe $\mathrm{KV} : \mathrm{VC} = \mathrm{KG} : \mathrm{GR}$, we have $\mathrm{GR}^2 = 2\mathrm{KG}^2 = 8\mathrm{VK}^2$; therefore $\mathrm{VP} \times \mathrm{RG}^2 = 8\mathrm{VP} \times \mathrm{VK}^2$. But $\mathrm{VG}^3 = 27\mathrm{VK}^3, = 27\mathrm{VK} \times \mathrm{VK}^2$: therefore, becauſe in the paraboloid $\mathrm{VP} \times \mathrm{VS}^2, = \mathrm{SR}^3$, or $\mathrm{VP} \times \mathrm{RG}^2 = \mathrm{VG}^3$, we have $8\mathrm{VP} \times \mathrm{VK}^2 = 27\mathrm{VK} \times \mathrm{VK}^2$, and $8\,\mathrm{VP} = 27\mathrm{VK}$; or $\mathrm{VK} : \mathrm{VP}$; that is, $\mathrm{AV} : \mathrm{VP} = 8 : 27$; or $\mathrm{VP} = \frac{27}{8}\,\mathrm{AV}$, or $\frac{27}{16}$ of the parameter of the parabola ABC. The evolute of the conical parabola is the curve called the ſemicubical parabola, and its parameter is $\frac{27}{16}$ of the conical parabola.

This inveſtigation is nearly the ſame with that given by Huyghens, which we prefer at preſent to the method generally employed, becauſe it keeps the principle of inference more cloſely in view.

Mr Huyghens has deduced a beautiful corollary from it. Since the parabola ABC is deſcribed by the evolution of the paraboloid VNR, the line RC is equal to the whole evolved arch RNV, together with the redundant tangent line AV. If therefore we take from CR a part Cκ equal to the redundant AV, the remainder κR is equal to the arch RNV of the paraboloid. We may do this for every poſition of the evolved radius, and thus obtain a ſeries of points V, β, κ, δ, ϵ, of the evolutrix of the paraboloid. We have even an eaſier method for obtaining the length of any part of the arch of the paraboloid, without the previous deſcription of the parabola ABC. Suppoſe P*y* the arch of the paraboloid, and *yz* the tangent; make $\mathrm{P}z = \frac{8}{27}$ of the parameter, and deſcribe the arch P*uu* of a circle; then draw from every tangent *yz* a parallel line *xv*, cutting the circle in *u*. The length of the arch *y*P is equal to $yz + uv$. The celebrated author congratulates himſelf, with great juſtice, on this neat exhibition of a right line equal to the arch of a curve, without the employment of any line higher than the circle. It is the ſecond curve that has been ſo rectified, the cycloid alone having been rectified by plain geometry a very few years before by Sir Chriſtopher Wren. It is very true, and he candidly admits it, that this very curve had been rectified before by Mr William Neill, a young gentleman of Oxford, and favourite pupil of Dr Wallis; as alſo by Mr Van Heuraet, a Dutch gentleman of rank, and an eminent mathematician. But both of theſe gentlemen had done it by means of the quadrature of a curve, conſtructed from the paraboloid after the manner of Dr Barrow, *Lect. Geom.* XI. Nor was this a ſolitary diſcovery in the hands of Mr Huyghens, as the rectification of the cycloid had been in thoſe of Sir Chriſtopher Wren; for the method of inveſtigation furniſhed Mr Huyghens with a general rule, by which he could evolve every ſpecies of paraboloid and hyperboloid, two claſſes of curves which come in the way in almoſt every diſcuſſion in the higher geometry. He obſerves, that the ratio of B*f* to E*e*, being always compounded of the ratios of B*f* to B*o*, and of B*o*, or D*d*, to E*e*; and the ultimate ratio of B*f* to B*o* being that of TE to TD, which is given by the nature of the paraboloid, we can always find the ratio of BE to BN, if we know that of D*d* to E*e*. In all curves, the ratio of D*d* to E*e* (taken indefinitely near), is that of the ſubtangent to the ſum of the ſubtangent and ordinate of a curve conſtructed on the ſame abſciſſa, having its ordinates equal to the ſubnormals DE, *de*, VK, &c. In the conic ſections the ratio is conſtant, becauſe the line ſo conſtructed is a ſtraight line; and, in the parabola, it is parallel to the axis. See farther properties of it in Barrow's *Lect. Geom.* XI.

From this inveſtigation, Mr Huyghens has deduced the following beautiful theorem:

Let a be the parameter of the paraboloid, x its abſciſſa, and y its ordinate; and let the equation be $a^m x^n = y^{m+n}$; let the radius of the evolute meet the tangent through the vertex A in Z. We ſhall always have $\mathrm{BN} = \frac{n}{m}\,\mathrm{BE} + \frac{m+n}{m}\,\mathrm{BZ}$. Thus,

$$\text{If } \left.\begin{array}{l} a\,x = y^2 \\ a^2 x = y^3 \\ a\,x^2 = y^3 \\ a\,x^3 = y^4 \\ a^3 x = y^4 \end{array}\right\} \text{ then BN} = \left\{\begin{array}{l} \mathrm{BE} + 2\,\mathrm{BZ} \\ \frac{1}{2}\,\mathrm{BE} + \frac{3}{2}\,\mathrm{BZ} \\ 2\,\mathrm{BE} + 3\,\mathrm{BZ} \\ 3\,\mathrm{BE} + 4\,\mathrm{BZ} \\ \frac{1}{3}\,\mathrm{BE} + \frac{4}{3}\,\mathrm{BZ}. \end{array}\right.$$

&c. &c.

This is an extremely ſimple and perſpicuous method of determining the radius of the evolute, or radius of curvature; and it, at the ſame time, gives us the rectification of many curves. It is plain that every geometrical curve may be thus examined, becauſe the ſubnormals DE, VK are determined; and therefore their differences are determined. Theſe differences are the ſame with the differences of D d and E e; and therefore the ratio of D d to E e is determined; that is, the ſubſidiary curve now mentioned can always be conſtructed.

There is a ſingular reſult from this rule, which would hardly have been noticed, if the common method for determining BN had alone been employed. The equation of the paraboloid is ſo ſimple, that the increaſe of the ordinates and diminution of curvature ſeem to keep pace together; yet we have ſeen that, in the vertex of the cubical parabola, the curvature is leſs than any circular curvature that can be named. In the legs, the curvature certainly diminiſhes as they extend farther; there muſt therefore be ſome intermediate point where the curvature is the greateſt poſſible. This is diſtinctly pointed out by Mr Huyghens's theorem. The evolute of this paraboloid (having $a^2x = y^3$) is a curve ONRNQ (fig. 9.) conſiſting of two branches RO, and RQ, which have a common tangent in R; the branch RQ has the axis AE for its aſſymptote. The thread unfolding from OR, its extremity, deſcribes the arch BC, and then, unfolding from RQ, it deſcribes the ſmall arch CB′A. When B′ is extremely near A, the thread has a poſition B′N′E, in which B'N is very nearly $\frac{1}{2}$BE. At C, if CE be biſected in G, GR is $\frac{3}{2}$ of CZ. Here CR the radius of curvature is the ſhorteſt poſſible. The evolutes of all paraboloids conſiſt of two ſuch branches, if $m + n$ exceeds 2.

Such is the theory of evolution and involution as delivered by Mr Huyghens about the year 1672. It was cultivated by the geometers with ſucceſs. Newton prized it highly, and gave a beautiful ſpecimen of its application to the deſcription, rectification, and quadrature of epicycloids, trochoids, and epicycles of all kinds. But it was eclipſed by the fluxionary geometry of Newton, which included this whole theory in one propoſition, virtually the ſame with Mr Huyghens's, but more comprehenſive in its expreſſion, and much more ſimple in its application. Adopting the unqueſtionable principle of Mr Huyghens, that the evolved thread is the radius of a circle which has the ſame flexures with the curve, the point of the evolute will be obtained by finding the length of the radius of the equicurve circle. The formula for this purpoſe is given in the article FLUXIONS of the *Encyclopædia*; but is incorrectly ſtated $= \frac{\overline{a+4}|^{\frac{3}{2}}}{2\sqrt{a}}$, inſtead of $\frac{\overline{a+4x}|^{\frac{3}{2}}}{2\sqrt{a}}$. The theorem alſo from which it is deduced $\left(r = \frac{\dot{z}^2}{-\dot{x}\ddot{y}}\right)$ is incorectly printed, and is given without any demonſtration, thereby becoming of very little ſervice to the reader. For which reaſon, it is neceſſary to ſupply the defect in this place.

Therefore let AbcdEf (fig. 10.) be a circle, of which C is the centre, and ACE a diameter; let the points b, c, d, of the circumference be referred to this diameter by the equidiſtant perpendicular ordinates bi, cg, dk; draw the chords bc, cd, producing dc till it meet the ordinate bi in a, produce cg to the circle in f, and join bf, df; draw bh, cm, perpendicular to the ordinates; then bh, cm, hc, md, bc, cd, are ultimately proportional to the firſt fluxions of the abſciſſa AE, the ordinate cg, and the arch A c; alſo ab, the difference between dm and ch is ultimately as the ſecond fluxion of the ordinate. The triangle abc is ſimilar to bdf; for the angle abc is equal to the alternate angle bcf, which is equal to bdf, ſtanding on the ſame ſegment. The angle acb is equal to bfd, ſtanding on the ſegment bcd; therefore the remaining angles bac and dbf are equal; therefore $ab : bc = bd : df = \frac{1}{2}bd : \frac{1}{2}df$. Now let the ordinates bi and dk continually approach the ordinate cg, and at laſt unite with it; we ſhall then have bc ultimately equal to $\frac{1}{2}bd$, and cg ultimately equal to $\frac{1}{2}df$. Therefore, ultimately, $ab : bc = bc : cg$, and $cg = \frac{bc^2}{ab}$.

Let u, v, w, repreſent the variable abſciſſa, ordinate, and arch. We have, for the fluxionary expreſſion of the ordinate of the equicurve circle, $v = \frac{\dot{w}^2}{-\ddot{v}}$ ($\ddot{v}$ muſt have the negative ſign, becauſe, as the arch increaſes, $\dot{v}$ diminiſhes). In the next place, it is evident that, ultimately, $bh : bc = cg : c\mathrm{C}$, and $c\mathrm{C} = \frac{cg \times bc}{bh}$. If r be the radius of the equicurve circle, we have $\dot{u} : \dot{w} = v : r$, and $r = \frac{v\dot{w}}{\dot{u}}$. But we had $v = \frac{\dot{w}^2}{-\ddot{v}}$. Subſtitute this in the preſent equation, and we obtain $r = \frac{\dot{w}^3}{-\dot{u}\ddot{v}}$. Laſtly, obſerve that $\dot{w}^2 = \dot{u}^2 + \dot{v}^2$, and $\dot{w} = \sqrt{\dot{u}^2 + \dot{v}^2} = \overline{\dot{u}^2 + \dot{v}^2}|^{\frac{1}{2}}$. Therefore $\dot{w}^3 = \overline{\dot{u}^2 + \dot{v}^2}|^{\frac{3}{2}}$ and we have $r = \frac{\overline{\dot{u}^2 + \dot{v}^2}|^{\frac{3}{2}}}{-\dot{u}\ddot{v}}$, as the moſt general fluxionary expreſſion of the radius of a circle, in terms of the ſine, coſine, and arch.

When a curve and a circle have the ſame curvature, it is not enough that the firſt fluxions of their abſciſſæ, ordinates, and arches, are the ſame. This would only indicate the poſition of their common tangent. They muſt have the ſame deflection from that tangent. This is always equal to half of the ſecond fluxion of the ordinate. Therefore the circle and curve muſt have the ſame ſecond fluxion of their ordinates. Therefore let D $b\,c\,d$ F be any curve coinciding with, or oſculated by, the circle A $b\,c\,d$. Let its axis be DG, parallel to the diameter AE; and let $c\,n$ be its ordinate. Let D n be $=x$, $c\,n=y$, and $b\,c=z$. We have $\dot{x}$, $\dot{y}$, $\dot{z}$, reſpectively equal to $\dot{u}$, $\dot{v}$, $\dot{w}$. Therefore the radius of the oſculating circle is $r=\frac{\dot{z}^3}{-\dot{x}\ddot{y}}$ or $r=\frac{\overline{\dot{x}^2+\dot{y}^2}|^{\frac{3}{2}}}{-\dot{x}\ddot{y}}$, for all curves whatever. (We recommend the careful peruſal of the celebrated 2d corollary of the 10th propoſition of the 2d book of Newton's Principia, where the firſt principles of this doctrine are laid down with great acuteneſs.)

Inſtead of ſuppoſing the ordinates equidiſtant, and conſequently $\dot{x}$ invariable, we might have ſuppoſed the ordinates to increaſe by equal ſteps. In this caſe y would have had no ſecond fluxion. The radius would then be $=\frac{\dot{z}^3}{\dot{y}\ddot{x}}$. Or, laſtly, we might ſuppoſe (and this is very uſual) the arch z to increaſe uniformly. In this caſe $r=\frac{\dot{z}\dot{y}}{\ddot{x}}$: For becauſe $\dot{x}^2+\dot{y}^2=\dot{z}^2$, by taking the fluxion of it, $2\dot{x}\ddot{x}+2\dot{y}\ddot{y}=0$, and $\ddot{y}=\frac{\dot{x}\ddot{x}}{\dot{y}}$; and therefore $r=\frac{\dot{z}^3}{\dot{y}\ddot{x}-\dot{x}\ddot{y}}$, $=\frac{\dot{z}^3}{\dot{y}\ddot{x}+\frac{\dot{x}^2\ddot{x}}{\dot{y}}}$, $=\frac{\dot{y}\dot{z}^3}{\overline{\dot{y}^2+\dot{x}^2}\times\ddot{x}}$, $=\frac{\dot{y}\dot{z}}{\ddot{x}}$.

Having thus obtained the radius of curvature, and conſequently a point of the evolute, we determine its form by reference to an abſciſs, without much farther trouble: It only requires the drawing Cp perpendicular to the axis of the propoſed curve, and giving the values of Cp and Dp. If we ſuppoſe $\dot{x}$ conſtant, then, cC being $=\frac{\dot{z}^3}{-\dot{x}\ddot{y}}$, we have D$p$ $(=\mathrm{D}\,n+g\,c$, $=\mathrm{D}\,n+\frac{\dot{y}}{\dot{z}}\times c\,\mathrm{C})=x+\frac{\dot{y}\dot{z}^2}{-\dot{x}\ddot{y}}$; and pC $(=c\,g-c\,n$, $=\frac{\dot{x}}{\dot{z}}\times c\,\mathrm{C}-c\,n)=\frac{\dot{z}^2}{-\ddot{y}}-y$. But if we ſuppoſe $\dot{y}$ conſtant; then, cC being $=\frac{\dot{z}^3}{\dot{y}\ddot{x}}$, we have D$p=x+\frac{\dot{z}^2}{\ddot{x}}$, and pC $=\frac{\dot{z}\dot{x}^2}{\dot{y}\ddot{x}}-y$. And if $\dot{z}$ be conſtant, then, cC being $=\frac{\dot{y}\dot{z}}{\ddot{x}}$, we ſhall have D$p$ $=x+\frac{\dot{y}^2}{\ddot{x}}$, and pC $=\frac{\dot{x}\dot{y}}{\ddot{x}}-y$.

Theſe formulæ are ſo many general expreſſions for determining both the curvature of the propoſed curve and the form of its evolute. They alſo give us the rectification of the evolute; becauſe cC is equal to the evolved arch, or to that arch, together with a conſtant part, which was a tangent to the evolute at its vertex, in thoſe caſes where the involute has a finite curvature at its vertex; as in the common parabola.

Let us take the example of the common parabola, that we may compare the two methods. The equation of this is $a\,x=y^2$, or $a^{\frac{1}{2}}x^{\frac{1}{2}}=y$. This gives $\dot{y}=\frac{1}{2}a^{\frac{1}{2}}\dot{x}x^{\frac{1}{2}}$ —, $=\frac{a^{\frac{1}{2}}\dot{x}}{2x^{\frac{1}{2}}}$, and (making $\dot{x}$ conſtant) $\ddot{y}=-\frac{1}{2}\times\frac{1}{2}a^{\frac{1}{2}}\dot{x}^2x^{-\frac{3}{2}}=\frac{-a^{\frac{1}{2}}\dot{x}^2}{4x^{\frac{3}{2}}}$. Wherefore $\dot{z}\ (=\sqrt{\dot{x}^2+\dot{y}^2})=\frac{\dot{x}}{2}\sqrt{\frac{4x+a}{x}}$, and the radius of curvature $\left(=\frac{\dot{z}^3}{-\dot{x}\ddot{y}}\right)=\frac{\overline{a+4x}|^{\frac{3}{2}}}{2\sqrt{a}}$. At the vertex, where $x=0$, the formula becomes $=\frac{1}{2}a$. Again, Dp $\left(=x+\frac{\dot{y}\ddot{z}^2}{-\dot{x}\ddot{y}}\right)$ becomes $\frac{1}{2}a+3x$; and therefore V$p=3x$, $=$ the abſciſſa of our evolute. Likewiſe $c\,p$, its ordinate, $\left(=\frac{\dot{z}^2}{-\ddot{y}}-y\right)$ $=\frac{4x^{\frac{3}{2}}}{\sqrt{a}}$; and C$p^2=\frac{16x^3}{a}$; and C$p^2\times a=16x^3$. But V$p=3x$, and V$p^3=27x^3$. Therefore C$p^2\times\frac{1}{16}$th $a=x^3$, $=\frac{1}{27}$th Vp^3, and $\frac{27}{16}$ths $a\times$ C$p^2=$ Vp^3. Therefore the evolute VC is a ſemicubical parabola, whoſe parameter is $\frac{27}{16}a$, as was ſhewn by Mr Huyghens. The arch VC is $=\frac{\overline{a+4x}|^{\frac{3}{2}}}{2\sqrt{a}}-\frac{1}{2}a$.

We ſhall give one other example, which comprehends the whole claſs of paraboloids. Their general equation is $y=a\,x^n$. This gives us $\dot{y}=n\,a\,x^{n-1}\dot{x}$, and $\ddot{y}=n\times\overline{n-1}\times a\,x^{n-2}\dot{x}^2$; therefore $\dot{z}$ $(=\sqrt{\dot{x}^2+\dot{y}^2})=\dot{x}\sqrt{1+n^2a^2x^{2n-2}}$; C$c$ $\left(=\frac{\dot{z}^3}{-\dot{x}\ddot{y}}\right)$ $=\frac{\overline{1+n^2a^2x^{2n-2}}|^{\frac{3}{2}}}{-n\times\overline{n-1}\times a\,x^{n-2}}$; D$p$ $\left(=x+\frac{\dot{y}\dot{z}^2}{-\dot{y}\dot{x}}\right)$ $=x-\frac{x+n^2a^2x^{2n-1}}{n-1}$; C$p$ $\left(=\frac{\dot{z}^2}{\ddot{y}}-y\right)=$ $\frac{1+\overline{2n-1}\times n\,a^2x^{2n-2}}{-\overline{n-1}\times n\,a\,x^{n-2}}$; and DV $=-\frac{n^2a^2 0^{2n-2}}{n-1}$.

This laſt formula expreſſes the radius of curvature at the vertex D, or the redundant part of the thread, by which it exceeds the arch VC of the evolute. If $n=\frac{1}{2}$, the formula becomes $\frac{a^2}{2}$; but if n be greater than this, VC will be $=0$; and if it be leſs, VC will be infinite. Hence it appears, that the radius of curvature at the vertex of a curve is a finite quantity only in the caſes where the firſt or naſcent ordinates are in the ſubduplicate ratio of their abſciſſæ. In all other caſes, the curvature is incomparable with that of any circle, being either what is called infinite (when n is greater than $\frac{1}{2}$) or nothing (when it is leſs).

We ſcruple not to ſay, that the method of Mr Huyghens is more luminous, more pleaſing to the imagination of a geometer, than this; and in all the caſes which occurred to us in our employment of it, it ſuggeſted more ready conſtructions, with the additional ſatisfaction of exhibiting, in a continuous train, what the *ſymbolical* method, proceeding by the fluxionary calculus, only indicates by points. We muſt alſo obſerve, that the ſubſidiary curve employed by Huyghens, having its ordinates equal to the ſubnormals of the involute under examination, is the geometrical expreſſion of that function of the involute which gives the ſecond fluxions $\ddot{y}$ and $\ddot{x}$ of the ordinate and abſciſſa. The young mathematician will find no difficulty in conſtructing this curve *in every caſe;* whereas we imagine that he will not find it a light matter to conſtruct the final equations of the ſymbolic method *almoſt in any caſe.* At the ſame time, the all comprehending extent of the latter method, and the numberleſs general theorems which it ſuggeſts to the expert analyſt, give it a moſt deſerved preference, and make it almoſt an indiſpenſable inſtrument for all who would extend our phyſico-mathematical ſciences.

In the employment of the geometry of curve lines, eſpecially in the doctrine of centripetal forces, it is uſual to conſider the ordinates, not as inſiſting on a rectilineal abſciſſa, but as diverging from a centre. This is alſo the uſual way of conceiving all ſpirals and evolutrixes of curves which include ſpace: in ſhort, all RADIAL curves. The proceſs for finding their evolute, or their radius of curvature, is ſomewhat different from that hitherto exhibited; but it is more ſimple. Thus, let GPM (fig. 10.) be the elliptical path of a planet, of which S is the focus. We require PC, the radius of curvature in the point P. Let Pp be a very ſmall arch. Draw the radii SP, Sp, the tangents PT, pt; and draw ST perpendicular to PT, cutting pt in t; and Po perpendicular to Sp. Let the arch GP be $= z$, the radius SP $= y$, and the perpendicular ST $= p$. Then, it is plain, that Pp, op, Tt, are ultimately proportional to $\dot{z}$, $\dot{y}$, $\dot{p}$. The triangles PCp, and Tpt or TPt are alſo ultimately ſimilar; as alſo the triangles PST and poP. Therefore, ultimately,

$$\mathrm{T}t : \mathrm{P}p = \mathrm{PT} : \mathrm{PC}$$

alſo $$\mathrm{P}p : po = \mathrm{PS} : \mathrm{PT}$$

therefore Tt : po = PS : PC, or, $\dot{p} : \dot{y} = y : r$, and $r = \frac{y\dot{y}}{\dot{p}}$; an expreſſion of the radius of curvature, extremely ſimple, and of eaſy application.

The logarithmic or equiangular ſpiral PQR (fig. 6.) affords an eaſy example of the uſe of this formula. The angle SPT, which the ordinate makes with the curve, is everywhere the ſame. Therefore let a be our tabular radius, and b the ſine of the angle SPT. We have ST $= \frac{by}{a}$; and therefore PC $\left(= \frac{y\dot{y}}{\dot{p}}\right) = \frac{ay\dot{y}}{b\dot{y}} = \frac{ay}{b}$. This is to SP or y in the conſtant ratio of a to b, or of SP to ST : that is, ST : SP = SP : PC, the triangles SPT and PCS are ſimilar, the angles at P and C equal, and C is a point of an equiangular ſpiral pyr round the centre S.

It is not meant that the conſtruction pointed out by this theory of involution, expreſſed in its moſt general and ſimple form, is always the beſt for finding the centre of the equicurve circle. Our knowledge of, or attention to, many other properties of the curve under conſideration, beſides thoſe which ſimply mark its relation to an abſciſs and ordinate, muſt frequently give us better conſtructions. But evolution is the natural geneſis of a line of varying curvature. Moreover, in the moſt important employment of mathematical knowledge, namely, mechanical philoſophy, it is well known, that the moſt certain and comprehenſive method of ſolving all intricate problems is by reference of all forces and motions to three co-ordinates perpendicular to each other. Thus, without any intentional ſearch, we have already in our hands the very fluxionary quantities employed in this doctrine; and the expreſſion which it gives of the radius of curvature requires only a change of terms to make it a mechanical theorem.

THUS have we conſidered the two chief queſtions of evolution and involution. We have done it with as cloſe attention to geometry as poſſible, that the reader's mind may become familiar with the *ipſa corpora* while acquiring the elementary knowledge, which is to be employed more expeditiouſly afterwards by the help of the ſymbolical analyſis. Without ſuch ideas in the mind, the occupation is oftentimes as much diveſted of thought as that of an expert accountant engaged in complex calculations; the attention is wholly turned to the rules of his art.

It now remains to conſider a little the nature of this curvature of which ſo much has been ſaid, and about which ſo many obſcure opinions have been entertained. We mentioned, in an early part of this article, the unwarranted uſe of the terms of infinite and infiniteſimal magnitude as applicable to curvature, and ſhewed its impropriety by the inconſiſtences into which it leads mathematicians. Nothing threw ſo much light on this ſubject as Mr Huyghens's Geometry of Evolution; and we ſhould have expected that all diſputes would have been ended by it. But this has not been the caſe; and even the moſt eminent geometers and metaphyſicians, ſuch as the Bernoullis and Leibnitz, have given explanations of orders of curvature that can have no exiſtence, and explanations of that coaleſcence which obtains between a curve line and its equicurve circle, which are not warranted by juſt principles.

Theſe errors (for ſuch we preſume to think them) aroſe from the method employed by the geometers of laſt century for obtaining a knowledge of the magnitude and variation of curvature. The ſcrupulous geometers of antiquity deſpaired of ever being able to compare a curve with a right line. The moderns, although taught by Des Cartes to define the nature of a curve by its equation, allowed that this only enabled them to exhibit a ſeries of points through which it paſſed, and to draw the polygon which connects theſe points, but gave no information concerning the continuous *incurvated* arches, of which the ſides of the polygon are the chords. They could not generally draw a tangent to any point, or from any point; but they could draw a chord through any two points. Des Cartes was the firſt who could draw a tangent. He contrived it ſo, that the equation which expreſſes the interſections of the curve with a circle deſcribed round a given centre ſhould have two equal roots. This indicates the coaleſcence of two interſections of the common chord of the circle and the curve. Therefore a perpendicular to the radius ſo determined muſt touch the curve in the point of their union. This was undoubtedly a great diſcovery, and worthy of his genius. It naturally led the way to a much greater diſcovery. A circle may cut a curve in more points than two: It may cut a conic ſection in four points; all expreſſed by one equation, having four roots or ſolutions. What if three of theſe roots ſhould be equal? This not only indicates a cloſer union than a mere contact, but alſo gives indication of the flexure of the intervening arch. For, before the union, the interſections were in the arch both of the curve and of the circle; and therefore the diſtinction between the union of two and of three interſections muſt be of the ſame kind with that between a ſtraight line and an arch of *this* circle. The flexure of a circle being the ſame in every part, it becomes a proper index; and therefore the circle, which is determined by the coaleſcence of three interſections, was taken as the meaſure of the curvature in that point of the curve, and was called the CIRCLE OF CURVATURE, the EQUICURVE CIRCLE. There is a certain progreſs to this coaleſcence which muſt be noticed. Let ABD (fig. 4.) be a common parabola, EBF a line touching it in B, and BO a line perpendicular to EBF. Taking ſome point O in the other ſide of the axis for a centre, a circle may be deſcribed which cuts the curve in four points a, b, c, and d. By enlarging the radius, it is plain that the points a and b muſt ſeparate, as alſo the points c and d. Thus, the points b and c approach each other, and at laſt coaleſce in a point of contact B, with the parabola, and with its tangent. In the mean time, a and d have retired to A and D. If we now bring the centre O nearer to B, the new circle will fall wholly within the laſt circle ABD; and therefore both A and D will again approach to each other, and to B, which ſtill continues a point of contact. It is plain that A will approach faſter to B than D will do. At length, the centre being in o, the point A coaleſces with B, and we obtain a circle $\varepsilon B \delta$, touching the curve in B, and cutting it in δ: Conſequently the arch $B \varepsilon \delta$ is wholly within, and $B \varphi \delta$ is wholly without the parabola; and the circle both touches and cuts the parabola in B. Here is certainly a cloſer union, at leaſt on the ſide of a. But perhaps a farther diminution of the circle may bring it cloſer on the ſide of D. Join $B \delta$. Let a ſmaller circle be deſcribed, touching the parabola in B, and cutting it in φ. Draw φc parallel to δB. It may be demonſtrated that the new circle cuts the parabola in c. Now the arch between c and φ being without the parabola, the arch B C muſt be within it; and therefore this circle is within the parabola on both ſides of B, and is more incurvated than the parabola. We have ſeen, that a circle greater than $\varepsilon B \delta$ is without the parabola on both ſides of B; and therefore is leſs incurvated than the parabola. Therefore the individual circle $\varepsilon B \delta$ is neither more nor leſs curve than the parabola in the point B. Therefore the circle indicated by the coaleſcence of three interſections is properly named the equicurve circle; and, ſince we meaſure all curvatures by that of a circle, it is *properly* the circle of curvature, and its radius is the radius of curvature.

Had B been the vertex of the axis, every interſection on one ſide of B would have been ſimilar to an interſection on the other, and there would always have been two pairs of roots that are equal; and therefore when three interſections coaleſce, a fourth alſo coaleſces, and the contact is ſaid to be ſtill cloſer.

What has now been ſhewn with reſpect to a conic ſection is true of every curve. When two interſections coaleſce, there is a common tangent; when three coaleſce, there is an equal curvature, and no other circle can paſs between this circle and the curve. There cannot be a coaleſcence of four interſections, except when the diameter is perpendicular to the ordinates, and thoſe are biſected by the diameter.

Mr Leibnitz, who valued himſelf for metaphyſical refinement, and never fails to claim ſuperiority in this particular, notices the important diſtinction between a ſimple contact and this cloſer union in a very well written diſſertation, publiſhed in the *Acta Eruditorum*, July 1686. He calls the contact of equal curvatures an OSCULATION, and the circle of equal curvature the OSCULATING CIRCLE, and delivers ſeveral very judicious remarks with the tone of a maſter and inſtructor. He alſo ſpeaks of different degrees or orders of oſculation, each of which is infinitely cloſer than the other, as a thing not remarked by geometers. But Sir Iſaac Newton had done all this before. The firſt twelve propoſitions of the *Principia* had been read to the Royal Society ſeveral years before, and were in the Regiſters. The *Principia* had received the imprimatur of the Society in July 1686; but was almoſt printed before that time. In the Scholium to the 11th Lemma, is contained the whole doctrine of contact and oſculation; and in the lemma and its corollaries, is crowded a body of doctrine, which has afforded themes for volumes. The author glances with an eagle's eye over the whole proſpect, and points out the prominent parts with the moſt compreſſed brevity; but with ſufficient preciſion for marking out the more important objects, and particularly the different orders of curvature. This lemma and its corollaries are continually employed in the twelve propoſitions already mentioned. In 1671 he had written the firſt draught of his method of fluxions, where this doctrine is ſyſtematically treated; and Mr Collins had a copy of it ever ſince 1676. It is well known that Leibnitz, when in London, had the free peruſal of the Society's records, and information at all times by his correſpondence with the ſecretary Oldenburgh and Mr Collins. His conduct reſpecting the theorems concerning the elliptical motion of the planets, and the reſiſtance of fluids, leave little room to doubt of his having availed himſelf in like manner of his opportunity of information on this ſubject. He gives a much better account of the Newtonian doctrine on this ſubject than in thoſe other inſtances, it being more ſuited to his refining and paradoxical diſpoſition.

In this and another diſſertation, he conſiders more particularly the nature of evolution, and of that oſculation which obtains between the evolutrix and the circle deſcribed by the evolved radius. He ſays, that it is equivalent to two ſimple contacts, each of which is equivalent to two interſections. An oſculation produced in the evolution of a curve is therefore equivalent to four interſections. And he adviſes, with an air of authority, the mathematicians to attend to theſe remarks, as leading them into the receſſes of ſcience. He is miſtaken, however; and the liſtening to him would prevent us from forming a juſt notion of oſculation, and from conceiving with diſtinctneſs the ſingular fact of a circle both touching and cutting a curve in the ſame point. James Bernoulli loſt his friendſhip, becauſe he preſumed to ſay that the preſence of four interſections in an oſculation is not warranted by the equation expreſſing thoſe interſections.

Mr Leibnitz was miſled by the way in which he had conſidered the oſculation in the evolution of curves. It merits attention. From any point within the ſpace ADFOA (fig. 1.), two perpendiculars may be drawn to the evolutrix A *b d f*; and therefore two circles may be deſcribed round that point, each touching the curve. Each contact is the union of two interſections. Therefore, as the centre approaches the evolute, the contacts approach each other, and they unite when the centre reaches the evolute. Therefore the oſculation of evolution is equivalent to four interſections.

But when two ſuch circles are deſcribed round a point *s*, ſo as that both may touch the evolutrix A *a f*, the point *s* is in the interſection of one evolved radius with the *prolongation* of another. The contact at the extremity *b* of the prolonged radius *b* B is an exterior contact, and the arch of the circle croſſes the evolutrix, from without inwards, in ſome point more remote from A. The contact at the extremity *e* of the radius *e* E is an interior contact; and if *e s* be greater than the ſtraight line EA, the arch of this circle croſſes the curve, from within outwards, in ſome point nearer to A. Thus each contact is accompanied by an interſection on the ſide next the other contact, ſometimes beyond it, and ſometimes between the contacts. As the contacts approach, the interſections alſo approach, ſtill retaining their characters as interſections, as the contacts ſtill continue contacts. Alſo the circle next to A croſſes from without inwards, and that next to *f* croſſes from within outwards. They retain this character to the laſt; and when the contacts coaleſce, the two circles coaleſce over their whole circumference, ſtill, however, croſſing the curve in the ſame direction as before; that is, without the curve on the ſide of A, and within it on the ſide of *f*. The contacts unite as contacts, and the interſections as interſections. Thus it is that the oſculating circle both touches and interſects the curve in the ſame point.

At *f* the oſculation is indeed cloſer than anywhere elſe. The variation of curvature is leſs there than anywhere elſe, becauſe the radius changes more ſlowly. It is this circumſtance that determines the cloſeneſs of contact. If a circle oſculates a curve, it has the ſame curvature. If this curvature does not change in the vicinity of the contact, the curve and circle muſt coincide; and the deviation of the circle (the curvature of which is everywhere the ſame) from the curve muſt proceed entirely from the variation of its curvature. This, therefore, is the important circumſtance, and is indeed the characteriſtic of the figure as a curve line; and its other properties, by which the poſition of its different parts are determined, may be aſcertained by means of the *variation* of its curvature, as well as by its relation to co-ordinates. Of this we have a remarkable inſtance at this very time. The orbit of the newly diſcovered planet has been aſcertained with tolerable preciſion by means of obſervations made on its motions for three years. In this time it had not deſcribed the 20th part of its orbit; yet the figure of this orbit, the poſition of its tranſverſe axis, the place and time of its perihelion, were all determined within 100dth part of the truth by the *obſerved variation* of its curvature. It therefore merits our attention in the cloſe of this article. We know of no author who has treated the ſubject in ſo inſtructive a manner as Mr M‘Laurin has done, by exhibiting the theorem which conſtitutes Newton's 11th lemma in a form which points this out even to the eye (ſee *M‘Laurin's Fluxions*, Chap. xi. § 363, &c.). We earneſtly recommend this work to the young geometer, as containing a fund of inſtruction and agreeable exerciſe to the mathematical genius, and as greatly ſuperior in perſpicuity and in ideas which can be treaſured up and recollected, when required, to the greateſt part of the elaborate performances of the eminent analyſts of later times. By expreſſing every thing geometrically, the author furniſhes us with a ſort of picture, which the imagination readily reviews, and which exhibits in a train what mere ſymbols only give us a momentary glimpſe of.

" As, of all right lines which can be drawn through a given point in the arch of a curve, that alone is the tangent which touches the arch ſo cloſely that no right line can paſs between them; ſo, of all circles which touch a curve in a given point, that circle alone has the ſame curvature which touches it ſo cloſely that no circle can paſs between them. It cannot coincide with the arch of the curve; and therefore the above condition is ſufficient for making it equicurve. As the curve ſeparates from the tangent by its flexure or curvature, it ſeparates from the equicurve circle by its *change* of curvature; and as its curvature is greater or leſs according as it ſeparates more or leſs from its tangent, ſo the variation of its curvature is greater or leſs according as it ſeparates more or leſs from its equicurve circle. There can be but one equicurve circle at one point of a curve, otherwiſe any other circle deſcribed between them through that point will paſs between the curve and the equicurve circle.

" When two curves touch each other in ſuch a manner that no circle can paſs between them, they muſt have the ſame curvature; becauſe the arch which touches one of them ſo cloſely that no circle can paſs between them, muſt touch the other in like manner. But circles may touch the curve in this manner, and yet there may be indefinite degrees of more or leſs intimate contact between the curve and its equicurve circle." This is ſhewn by the ingenious author in a ſeries of propoſitions, of which a very ſhort abridgment muſt ſuffice in this place.

Let any curve EMH (fig. 11.), and a circle ERB, touch a right line ET on the ſame ſide at E. Let any right line TK, parallel to the chord EB of the circle, meet the tangent in T, the curve in M, and a curve BKF (which paſſes through B) in K. Then, if $MT \times TK$ be everywhere equal to TE^2, the curvature of EMH in the point E is the ſame as that of the circle ERB; and the contact of EM and ER is ſo much the cloſer the ſmaller the angle is which is contained at B between the curve BKF and the equicurve circle BQE.

Let TK meet the circle in R and Q. Then, becauſe $RT \times TQ = TE^2$, it muſt be $RT \times TQ = MT \times TK$; and $RT : MT = TK : TQ$. The line BKF may have any form. It may croſs the circle BQR in B, as in the figure. It may touch it, or touch EB, &c. Let us firſt conſider what ſituations of the point M correſpond with the poſition of K, in that part of the curve BKF which lies without the circle BRE.

Let TK move toward EB, always keeping parallel to it, till it coincide with it, or even paſs it. Then, while the point K deſcribes KB, it is evident that ſince TK is greater than TQ, TM muſt be leſs than TR, and the point M muſt always be found between T and R. The arch ME of the curve muſt be nearer to the tangent than the arch RE of the circle. If any circle be now deſcribed touching TE in E, and cutting off from EB a ſmaller chord than EB, it is clear that the whole of this ſegment muſt be within the ſegment BRE; therefore this ſmaller circle does not paſs between ERB and the curve EMH. But ſince we ſee that the curve lies without the circle, in the vicinity of E, perhaps a greater circle than ERB may paſs between it and the curve. A greater circle, touching at E, muſt cut off a chord greater than EB. Let E r b be ſuch a circle, cutting EB in b, and TQ in q. T q is neceſſarily greater than TQ. For ſince b is beyond B, and the arch BKF lies in the angle QB b, the circle E r q muſt croſs the curve FKB in ſome point; ſuppoſe F. Then while K is found in the arch FB, the point q muſt be beyond K, or T q muſt be greater than TK. Now $Tr \times Tq = TE^2, = TM \times TQ$. Therefore $TM : Tr = Tq : TQ$. Therefore T q being greater than TQ, T r muſt be leſs than TM, and the point r muſt lie without the curve, and the arch E r does not paſs between EMH and the circle ERB. In like manner, on the other ſide of EB, it will appear, that when the curve BK′F falls within the circle which touches EMH in E, and cuts off the chord EB, the arch of the curve correſponding to the arch BK′F′, lying within the circle, alſo lies within the circle. For T′K′ being leſs than TQ′, TM′ is greater than TR′, and the curve is within the circle. And, by ſimilar reaſoning, it is evident that a circle cutting off a greater chord falls without both the circle ER′B and the curve, and that a circle leſs than ER′B muſt neceſſarily leave ſome part of the curve BK′F′ without it; and therefore TK′ will be greater than T q', and the correſponding point r' muſt be without the curve. All circles therefore touching TE in E fall without both ER and EM, or within them both, according as they cut off from EB a chord greater or leſs than EB, and no circle can paſs between them when the rectangle $MT \times TK$ is always equal to ET^2, and the focus of the point K paſſes through B; that is, ERB is the equicurve circle at E.

This corroborates the ſeveral remarks that we have made on the circumſtance of a circle touching and cutting a curve in the ſame point. No other circle can be made to paſs between it and the curve, and it therefore has the ſame curvature. This may therefore be taken as a ſufficient indication of the equicurve circle; the character peculiarly aſſured to it by the nature of evolution. It muſt be noted, however, that the curve is ſuppoſed to have its concavity in the vicinity of the contact turned all the ſame way. For if the contact be in a point of contrary fluxure, even a ſtraight line will both touch and cut it in that point.

The reader cannot but remark, that MK is always the chord of a circle touching TE in E, and paſſing through M.

Let E m be another curve, touching TE in E, ſuch, that the conjugate curve k B, which always gives $Tm \times Tk = TE^2$, alſo paſſes through B. Then, by what has now been demonſtrated, the two curves EM and E m have the ſame equicurve circle ERB, and conſequently the ſame curvature in E. Then, becauſe the rectangles $RT \times TQ$, $MT \times TK$, and $mT \times Tk$, are equal, we have $Tm : TM = TK : Tk$. Therefore if the arch B k paſs between BK and BQ, the curve E m muſt paſs between the curve EM and the circle ER. E m muſt therefore have a cloſer contact with ER than EM has with it; and the ſmaller the angle QBK is which is contained between the curve and its equicurve circle, the cloſer is the contact of the curve EM and its equicurve circle ER. Thus the length of the chord EB determines the *magnitude* or degree of curvature at E, when compared with another; and the angle contained between the equicurve circle and the conjugate curve BKF determines the cloſeneſs of the contact of the curve with its equicurve circle (the angle TEB being ſuppoſed the ſame in both).

It appears, from the proceſs of demonſtration, that the curve EMH falls without or within the equicurve circle according as its conjugate curve BKF does. Alſo, when BKF cuts BQR, HME alſo cuts it. But if FQB is on the ſame ſide of QB on both ſides of the interſection B, the curve HME is alſo on the ſame ſide of it on both ſides of the contact E. It is alſo very clear, that the contact or approach to coaleſcence between the curve and its circle of curvature, is ſo much the cloſer as the conjugate curve BKF comes nearer to the adjoining arch of this circle. It muſt be the cloſeſt of all when KB touches QB, and it muſt be the leaſt ſo when KB touches EB, or has EB for an aſſymptote. The ſpace QBK is a ſort of magnified picture of the ſpace MER; and we have a ſenſible proportion of TQ to TK as the repreſentation of the proportion of TM to TR, quantities which are frequently evaneſcent and inſenſible. When QBK is a finite angle, that is, when the tangents of BQ and BK do not coincide, the angle QBK can be meaſured. But no rectilineal angle can be contained as an unit in the curvilineal angle MER. They are incommenſurable, or incomparable. Let the curve KB touch the circle QB without cutting it. This angle is equally incomparable with the former QBK; yet it has a counterpart in MER. This muſt be incomparable with the former in the ſame manner; for there is the ſame proportion between the individuals of both pairs. Thus it appears plainly, that there are curvilineal angles incomparable with each other. Yet are they magnitudes of one kind; becauſe the ſmalleſt rectilineal angle muſt certainly contain them both; and one of them contains the other. But, further, there may be indefinite degrees of this coaleſcence or cloſeneſs of contact between a curve and a circle. The firſt degree is when the ſame right line touches both. This is a *ſimple contact*, and may obtain between any curve and any circle. The next is when EMH and ERB have the ſame curvature, and when the conjugate curve FKB interſects the circle QB in any aſſignable angle. This is an *oſculation*. The third degree of contact, and ſecond of oſculation, is when the curve KB touches the circle QB, but not ſo as to oſculate. The fourth degree of contact, and third of oſculation, is when KB and QB have the ſame curvature or oſculate in the firſt degree of oſculation. This gradation of more and more intimate contact, or (more properly ſpeaking) of approximation to coaleſcence, may be continued without end, "*neque novit natura limitem,*"

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the contact of EM and ER being always two degrees cloſer than that of BK and BQ. Moreover, in each of thoſe claſſes of contact there may be indefinite degrees. Thus, when EM and ER have the ſame curvature, the angle QBK admits of indefinite varieties, each of which aſcertains a different cloſeneſs of contact at E. Alſo, though the angle QBK ſhould be the ſame, the contact at E will be ſo much the cloſer the greater the chord EB is.

For TR : TM = TK : TQ

Therefore RM : TR = KQ : KT

Or RM : KQ = TR : TK ; = TR × TQ : TK × TQ, = TE^2 : TK × TQ.

Therefore, when TE is given, RM (which is then the meaſure of the angle of contact) is proportional to KQ directly, and to the rectangle TK × TQ inverſely; and when KQ is given, RM is leſs in proportion as KT × TQ is greater. In the very neighbourhood of E and B, it is plain that KT × TQ is very nearly equal to EB^2, and therefore ultimately RM : KQ = $\text{ET}^2 : \text{EB}^2$.

It will greatly aſſiſt our conception of this delicate ſubject, if we view the origin of theſe degrees of contact as they are generated by the evolution of lines. A thread evolving from a polygon EDCBA (fig. 13.) deſcribes with its extremity *a* a line *e d b c a*, conſiſting of ſucceſſive arches of circles united in ſimple contacts. If it evolve from any continuous curve CBA, after having evolved from the lines ED, BC, the arch *c b* will be united with the circular arch *d c* by oſculation of the firſt degree. If any other curve FC touch this evolute in a ſimple contact, and if the two curves FCBA and DCBA are both evolved, they will touch each other in a ſimple oſculation in that point where they have the ſame radius. If FC touches DC in a ſimple oſculation, the evolved curves will touch in an oſculation of the ſecond degree; and, in general, the oſculation of the two generated curves is a degree cloſer than that of their evolutes; and in each ſtate of one of the oſculations, there is an indefinite variety of the other, according to the length of its radius of curvature. All this is very clear; and ſhews, that theſe degrees of contact do not indicate degrees of curvature, one of which infinitely exceeds another; for they are all finite.

The reader will do well to remark, that the magnitude, which is the ſubject of the above proportions, which is really of the ſame kind in them all, and conſidered as ſuſceptible of various degrees and orders of infiniteſimals, is not curvature, but lineal extenſion. It is RM, the ſubtenſe of the angle of contact MER. It is the linear ſeparation from the tangent, or from the equicurve circle. It is, however, uſually conſidered as the meaſure of curvature, or the proportions of this line are given as the proportions of the curvature. This is inaccurate; for curvature is unqueſtionably a change of direction only. As this line has generally been the intereſting object in the refined ſtudy of curve lines, eſpecially in the employment of it in the diſcuſſions of mechanical philoſophy, it has attracted the whole attention, and the language is now appropriated to this conſideration. What is called, by the moſt eminent mathematicians, variation of curvature, is, in fact, variation of the ſubtenſe of the angle of contact. But it is neceſſary always to diſtinguiſh them carefully.

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Variation of curvature is the remaining object of our attention.

Curvature is uniform in the circle alone. When the curvature of the arch EMH (fig. 11.) decreaſes as we recede from E, the arch, being leſs deflected from its primitive direction ET than the arch ER, muſt ſeparate leſs from the line ET, or muſt fall without the arch ER. The more rapidly its curvature decreaſes, the deſcribing point muſt be left more without the circle. It muſt be the contrary, if its curvature had increaſed from E toward M. It may change its curve equably or unequably. If equably, there muſt be a certain uniform rate, which would have produced the ſame final change of direction in a line of the ſame length, bending it into the uniformly incurvated arch of a circle. It is not ſo obvious how to eſtimate a rate of variation of curvature; and authors of eminence have differed in this eſtimation. Sir Iſaac Newton, who was much intereſted in this diſcuſſion, in his ſtudies on univerſal gravitation, ſeems to have adopted a meaſure which beſt ſuited his own views; and has been followed by the greater number. He gives a very clear conception of what he means, by ſtating what he thinks a caſe of an invariable rate of variation. This is the equiangular ſpiral, all the arches of which, comprehended in equal angles from the centre, are perfectly ſimilar, although continually varying in curvature. He calls this a curve EQUABLY VARIABLE, and makes its rate of variation (eſtimated in that ſenſe in which it is uniform) the meaſure of the rate of variation in all other curves. Let us ſee in what reſpect its variation of curvature is conſtant. It may be deſcribed by the evolution of the ſame ſpiral in another poſition (ſee fig. 6.), and the ratio between the radius of the evolute and that of the evolutrix is always the ſame; or (which amounts to the ſame thing) the arch of the evolutrix bears to the evolved arch of the evolute a conſtant ratio. The curvature of the ſpiral changes more rapidly in the ſame proportion as the ratio of the evolved arch to the arch of the evolutrix generated by it is greater, or as it cuts the radii in a more acute angle. Theſe arches may be infiniteſimal; therefore the fraction $\frac{\text{fluxion of evolute}}{\text{fluxion of evolutrix}}$ expreſſes the rate of the variation of curvature in this ſpiral, Now let *a b c d* (fig. 13.) be any other curve, and ABCD its evolute; let *p* be the centre of curvature at the point B of the evolute, and B *o* the evolved arch; draw the radii *p* B, *p o*, B *m*, *o n*; join *p m*, and draw B *q* perpendicular to *p m*. It is evident that *m n* and B *o* have the ſame ratio with B *m* and B *p*; and that theſe two ſmall arches may be conceived as being portions of the ſame equiangular ſpiral (perhaps in another poſition), of which *q* is the centre; and that *p* is in the curve of another of the ſame. For *q p* : *q* B = *q* B : *q* M, = *p* B : B *m*; therefore the ratio of theſe infiniteſimal arches *m n* and B *o* will expreſs the rate of variation in any curve. This is evidently equivalent to ſaying, that the variation of curvature is proportional to the fluxion of the radius of curvature directly, and the fluxion of the curve inverſely. For *m n* and B *o* are ultimately as thoſe fluxions, and $\frac{\text{B}\,o}{m\,n}$ is equivalent to $\frac{-\dot{r}}{\dot{z}}$, where *z* is the arch of the ſpiral, and *r* the evolved radius of the other. Accordingly, this is the enunciation of the INDEX OF VARIATION given by Newton (See Newton's Fluxions, Prob. VI. § 3.). Therefore, what Newton calls a uniform variation of curvature, is not an increaſe or diminution by equal arithmetical differences, but by equal proportions of the curvature in every point. The variation of curvature in ſimilar points of ſimilar arches is ſuppoſed to be the ſame.

It is evident that this ratio is the ſame with that of radius to the tangent of the angle *p m* B, or of 1 to its tabular tangent. The tangent therefore of this angle correſponding to any point of a curve is the meaſure of the variation of curvature in that point. Now it may be ſhewn (and it will appear by and bye), that the fluxion of TK in fig. 11. or the ultimate value of KQ, is always $\frac{2}{3}$ds of the fluxion of the radius of curvature. Therefore the tangent of the angle QBK is always $\frac{2}{3}$ds of that of *p m* B; and therefore the angle QBK, which we have ſeen to be an index of the cloſeneſs of contact, is alſo the index of the variation of curvature (See *M'Laurin*, § 386.).

Sir Iſaac Newton has given ſpecimens of the uſe of this meaſure in a variety of geometrical curves, by means of a general expreſſion of $\frac{\dot{r}}{\dot{z}}$. Thus, in the curve ABC (fig. 8.), let AB be $= z$, AD $= x$, DB $= y$, BN $= r$, and BE $= p$; we have $\frac{\mathrm{N}n}{\mathrm{B}b} = \frac{\dot{r}}{\dot{z}}$. Now DB : BE $= y : p, = \mathrm{D}d : \mathrm{B}b, = \dot{x} : \dot{z}$. Therefore $\dot{z} = \frac{p\dot{x}}{y}$, and $\frac{\dot{r}}{\dot{z}} = \frac{y\dot{r}}{p\dot{x}}$. Now, in every curve which we can expreſs by an equation, we can obtain all theſe quantities $p, y, \dot{r}$, and $\dot{z}$, and can therefore obtain the meaſure of the variation of curvature. It alſo deſerves particular notice, that this inveſtigation of $\frac{\dot{r}}{z}$ is equivalent with finding the centre and radius of curvature of the evolute, by which the curve under conſideration is generated; or with finding the centre *q* (fig. 13.) of an equiangular ſpiral, which will touch our curve in *m*, its evolute in B, and the evolute of the evolute in *p*, if put into different poſitions when neceſſary. This leads to very curious ſpeculations, for which, however, we have no room. It has been ſaid, for inſtance, that the curvature at the interſection of a cycloid with its baſe is infinitely greater than that of any circle. If the evolution of the cycloid begin from this point, the curvature of its evolutrix will be infinitely greater ſtill upon the ſame principles; and we ſhall have one infinitely greater than this by evolving it. Yet all theſe infinities, multiplied to infinity, are contained in the central point of every equiangular ſpiral! In like manner, there are evolutrixes which coincide with a ſtraight line, and others of infinitely greater rectitude, and ſtill they are curves. Can this have any meaning? And can it be reconciled with the legitimate reaſoning from the ſame principles, that all theſe curvatures and angles of contact are producible by evolution; and that they may be, and certainly are every day deſcribed, by bodies moving in free ſpace, and acted on by accelerating forces directed to different bodies?

The parabola (conical) is the moſt ſimple of all the lines of unequably varying curvature, and becomes a very good ſtandard of compariſon. In the parabola ABC (fig. 8.) let the parameter be $2a$. The equation is then $2ax = y^2$; DE $= a$; p, or BE $= \sqrt{a^2 + y^2}$ DQ $= a + 2x$ (by what was formerly demonſtrated). Moreover, DB : BE = DQ : BN; and BN $= \frac{pa + 2px}{a}, = r$. Theſe equations give $2a\dot{x} = 2y\dot{y}, = 2p\dot{p}$ and $\frac{a\dot{p} + 2x\dot{p} + 2p\dot{x}}{a} = \dot{r}$. Now making $\dot{x} = 1$, and reducing the equations, we obtain $\dot{y} = \frac{a}{y}$; $\dot{p} = \frac{y\dot{y}}{p}, = \frac{a}{p}$; and $\dot{r} = \frac{a\dot{p} + 2x\dot{p} + 2p}{a}$.

With theſe values of $\dot{y}, \dot{p}, \dot{r}$, we obtain a numeric value of $\frac{y\dot{r}}{p}$ moſt readily. Thus, in order to obtain the index of variation of curvature in the point where the ordinate at the focus cuts the parabola, make $a = 1$. Then $2x = y^2$; $x = \frac{1}{2}$, $y\ (= \sqrt{2x}) = 1$; $\dot{y}\left(= \frac{a}{y}\right) = 1$; $p\ (= \sqrt{a^2 + y^2}) = \sqrt{2}$; $\dot{p}\left(= \frac{a}{p}\right) = \sqrt{\frac{1}{2}}$, and $\dot{r}\left(= \frac{a\dot{p} + 2x\dot{p} + 2p}{a}\right) = \sqrt{2} \times 3$. Therefore $\frac{y\dot{r}}{p} = 3, =$ the index of variation in the point B when D is the focus of the parabola; that is to ſay, the fluxion of the radius of curvature is three times the fluxion of the curve.

The index of variation, where the ordinate is equal to the parameter, is had by making $x = 2$. This gives $y = 2$; $\dot{y} = \frac{1}{2}$; $p = \sqrt{5}$; $\dot{p} = \sqrt{\frac{1}{5}}$, and $\dot{r} = 3\sqrt{5}$. Wherefore $\frac{y\dot{r}}{p} = 6$, which is the index of variation. Moreover, ſince p and $\dot{r}$ are in a conſtant ratio, it appears that the index of variation of curvature in the parabola is proportional to the ordinate y. It is always $= 6\,\frac{\text{ordinate}}{\text{parameter}}$; and thus, with very little trouble, we can deſcribe the evolute of its evolute, *i. e.* of the ſemicubical parabola.

In like manner, it may be ſhewn, that in all the conic ſections $\frac{\dot{r}}{\dot{z}}$ is always proportional to the rectangle of the ordinate DB and the ſubnormal DE, or to DB × DE. In the parabola, whoſe equation is $2ax = y^2$, we have $\frac{\dot{r}}{\dot{z}} = \frac{3y}{a}$. In an ellipſe, whoſe equation is $2ax - bx^2 = y^2$, we have $\frac{\dot{r}}{\dot{z}} = \frac{3 - 3b}{a} \times \mathrm{DB} \times \mathrm{DE}$, and in the hyperbola, whoſe equation is $2ax + bx^2$, $\frac{\dot{r}}{\dot{z}}$ is $= \frac{2 + 3b}{a} \times \mathrm{DB} \times \mathrm{DE}$. This ratio, in all the three ſections, is always as the tangent of the angle contained between the diameter and the normal at the point of contact. By this we may compare them with a parabola. In the cycloid at the point E.

(fig. 5.) $\frac{\dot{r}}{\dot{z}}$ is = tan. ∠ EKM, &c. &c.

All theſe things may be traced in the obſervations made on fig. 11. and 12. When the angle BET is a right angle, the angle KBQ indicates it directly, its tangent being always $= \frac{2\dot{r}}{3\dot{z}}$. It is eaſy alſo to ſee, that when the curve EMH is a parabola, the line BKF is a ſtraight line parallel to ET. It is alſo plain, that by the ſame ſteps that we proved that no circle can paſs between this parabola and its equicurve circle ERB, ſo no other parabola can paſs between them. Indeed the ſame reaſoning will prove that no curve of the ſame kind can paſs between any curve and its oſculating circle. In many caſes, it is more eaſy to reaſon from the curvature of a curve, by comparing it with an equicurve parabola than with an equicurve circle; particularly in treating of the curvilineal motions of bodies in free ſpace, actuated by deflecting forces.

If EMH be an ellipſe or hyperbola, BKF is another ellipſe or Hyperbola *(M'Laurin, § 373.)*

We have thus endeavoured to introduce our readers into this curious branch of ſpeculative geometry. An introduction is all that can be expected from a work of this kind. We have enlarged on particular points, in proportion as we thought that the notions entertained on the ſubject were inadequate, or even vague and indiſtinct; and we hope that ſome may be incited to acquire clearer conceptions by going to the fountain head. We conclude, by recommending to the young geometer the peruſal of the Fluxions of Sir Iſaac Newton, after he has read M'Laurin's Chapter with care. He will probably be ſurpriſed and delighted with ſeeing the whole compreſſed by a maſter's hand into ſuch narrow compaſs with ſuch beautiful perſpicuity.

JOAN d' Arc, the maid of Orleans, has been variouſly characteriſed; but all now agree, that ſhe was worthy of a better fate than the horrid death ſhe was doomed to die. (See Joan *d'Arc, Encycl.*). But did ſhe actually die that death? An ingenious writer in the *Monthly Magazine* has proved, we think, that ſhe did not.

The biſhop of Beauvais (ſays he) is accuſed by all parties of treachery and trick in the conduct of the trial: it was his known propenſity to gain his ends by ſtratagem, craft, manœuvre, fraud, dexterity. He ſeeks out, and brings forward, ſuch teſtimony only as relates to eccleſiaſtical offences, and then hands over the deciſion to the ſecular judges, whoſe clemency he invokes. Joan ſays to him publicly, "You * *promiſed* to reſtore me to the church, and you deliver me to my enemies." The intention of the biſhop, then, muſt have been, that the ſecular judges, for want of evidence, ſhould ſee no offence againſt the ſtate; as the clerical judges, notwithſtanding the evidence, had declined to ſee any againſt the church. A fatal ſentence was, however, pronounced; and the fulfilment of it entruſted to the eccleſiaſtical authorities. Immediately after the *auto da fé*, one of the executioners ran to two friars, and ſaid, "that he had never been ſo ſhocked at any execution, and that the Engliſh had built up † a ſcaffolding of plaſter (*un echafaud de platre*) ſo lofty, that he could not approach the culprit, which muſt have cauſed her ſufferings to be long and horrid." She was, therefore, by ſome *unuſual* contrivance, kept out of the reach and obſervation even of the executioners.

Some time after, when public commiſeration had ſucceeded to a vindictive bigotry, a woman appeared at Metz‡, who declared herſelf to be Joan of Arc. She was everywhere welcomed with zeal. At Orleans, eſpecially, where Joan was well known, ſhe was received with the honours due to the liberatreſs of the town. She was acknowledged by both her brothers, Jean and Pierre d'Arc. On their teſtimony ſhe was married by a gentleman of the houſe of Amboiſe, in 1436. At their ſolicitation her ſentence was annulled in 1456. The Pariſians, indeed, long remained incredulous: they muſt elſe have puniſhed thoſe eccleſiaſtics, whoſe humanity, perhaps, conſpired with the biſhop of Beauvais to withdraw her from real execution down a central chimney of brick and mortar; or, as the executioner called it, a ſcaffolding of plaſter. The king, for the woman ſeems to have ſhunned no confrontation, is ſtated to have received her with theſe words: "*Pucelle, m'amie, ſoyez la tres bien revenue, au nom de Dieu.*" She is then ſaid to have communicated to him, kneeling, the artifice practiſed. Can this woman be an impoſtor? Our author thinks not, and appeals to Voltaire, who, in his proſe works, ſeems willing to allow that ſhe was not, as is too commonly imagined, one of thoſe half-inſane enthuſiaſts, employed as tools to work upon the vulgar; whom the one party endeavoured to cry up as a propheteſs, and the other to cry down as a witch; but that ſhe was a real heroine, ſuperior to vulgar prejudice, and no leſs remarkable by force of mind than for a courage and ſtrength unuſual in her ſex. This opinion is certainly countenanced by her behaviour in adverſity, and during her trial, which was firm without inſolence, and exalted without affectation.

JOHN, BAYOUK OF St, a little creek which furniſhes a very eaſy communication from New-Orleans to Weſt-Florida. It is navigable for veſſels drawing about 4 feet water 6 miles up from the lake Ponchartrain, where there is a landing place, at which veſſels load and unload: this is about 2 miles from the town. The entrance of the Bayouk of St John is defended by a battery of 5 or 6 cannon. There are ſome plantations on the Bayouk, and on the road from thence to New-Orleans.—*Morse.*

John de Frontiera, St, is the chief town of the province of Cuyo in Peru.—*ib.*

John's College, St, in Maryland, is ſituated in the city of Annapolis, was inſtituted in 1784, to have 24 truſtees, with power to keep up the ſucceſſion by ſupplying vacancies, and to receive an annual income of £9,000. It has a permanent fund of £1,750 a year, out of the monies ariſing from marriage licenſes, fines and forfeitures on the Weſtern Shore. This college, with Waſhington college at Cheſtertown, conſtitute one univerſity, named "The Univerſity of Maryland." The convocation of the Univerſity of Maryland, who are to frame the laws, preſerve uniformity of manners and literature in the colleges, confer the higher degrees, determine appeals, &c.—*ib.*

John's Island, in South-Carolina, lies S. W. of Charleſton harbour, divided from James's Iſland by Stono river, which forms a convenient and ſafe harbour. —*ib.*

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* *Villaret Hiſtoire de France*, tom. xv. p. 72.

† *Paſquier Hiſtoire d'Orleans*, liv. vi.

‡ *Hiſtoire de la Pucelle par l' Abbé Lenglet.* See alſo *Melanges Curieux Monſtrelet;* and the manuſcript authorities cited by the continuator of Velly.

John's, St, one of the chief towns of Newfoundland iſland, ſituated on the eaſt coaſt, 6 miles north-weſt of Cape Spear, and 18 ſouth-eaſt of Cape St Francis. N. lat. 47° 32′, W. long. 52° 21′. It lies on the bay of the ſame name. Its harbour is one of the beſt in the iſland, and has from 10 to 17 fathoms water up to King's wharf, which is a little to the north-weſt of the Old Fort, at the bottom of the town, and is a mile from the mouth of the harbour. A mile further is the mouth of Caſtor river, in which diſtance there is from 14 to 4 fathoms of water. On the ſouth ſide of this river is King's wharf, an hoſpital, and a watering place. Near theſe are the hills called the High Lands of St John's. N. lat. 47° 32′, W. long. 52° 29′.—*ib.*

John's, St, a bay and iſland on the weſt coaſt of Newfoundland iſland, in the gulf of St Lawrence, at the ſouth-weſt end of the ſtraits of Belliſle.—*ib.*

John's River, St, in Eaſt-Florida riſes in or near a large ſwamp in the heart of Eaſt-Florida, and purſues a northern courſe, in a broad navigable ſtream, which in ſeveral places ſpreads into broad bays or lakes; of which Lake George is the chief. Veſſels that draw 9 or 10 feet water, may navigate ſafely through the weſt channel into St John's river as far as Lake George. The bar at the mouth is liable to ſhift. It is 10½ leagues north of St Auguſtine.—*ib.*

John's River, *Little St*, in Weſt Florida, falls into Apalache Bay, about 10 miles eaſtward of Apalache river. It is ſaid to be the cleareſt and pureſt of any in America, is about 200 yards broad, and about 15 or 20 feet deep at the town of Talahaſpchete. The ſwamp called Ouaquaphenogaw is ſaid to be its ſource, which is 100 miles by land from Talahaſochete, and, following its windings, from the ſea 200 miles. The Indians and traders ſay it has no branches, or tributaries, which fall into it; but that it is fed by great ſprings which break out through the banks.—*ib.*

John's, St, is the largeſt river in the Britiſh province of New-Brunſwick. From its mouth on the north ſide of the bay of Fundy, to its main ſource is computed to be 350 miles. The tide flows 80 or 90 miles up this river. It is navigable for ſloops of 50 tons 60 miles, and for boats 200. Its general courſe from its ſource is E. S. E. It furniſhes the greateſt plenty of ſalmon, baſs, and ſturgeon; and is the common route to Quebec. About a mile above the city of St John's is the only entrance into this river. It is about 80 or 100 yards wide, and about 400 yards in length; called the falls of the river. It being narrow, and a ridge of rocks running acroſs the bottom of the channel, on which are not above 17 feet of water, it is not ſufficiently ſpacious to diſcharge the freſh waters of the river above. The common tides flowing here about 20 feet, the waters of the river, at low water, are about 12 feet higher than the waters of the ſea; at high water, the waters of the ſea are about five feet higher than thoſe of the river; ſo that in every tide there are two falls, one outwards and one inwards. The only time of paſſing with ſafety is at the time when the waters of the river are level with the waters of the ſea, which is twice in a tide, and continues not more than 20 minutes each time. At other times it is either impaſſable or extremely dangerous; reſembling the paſſage of Hell Gate near New-York. The banks of this river, enriched by the annual freſhets, are excellent land. About 30 miles from its mouth commences a fine level country of rich intervale and meadow lands, well cloathed with timber and wood, ſuch as pine, beech, elm, maple, and walnut. It has many tributary ſtreams, which fall into it on each ſide, among which are the Oromocto river, by which the Indians have a communication with Paſſamaquoddy; the Naſhwach and Madamkiſwick, on which are rich intervales that produce all kinds of grain in the higheſt perfection. This noble river, in its numerous and extenſive branches, waters and enriches a large tract of excellent country, a great part of which is ſettled and under improvement. The up-lands, in general, are covered with a fine growth of timber, ſuch as pine and ſpruce, hemlock and hardwood, principally beech, birch, maple, and ſome aſh. The pines on this river are the largeſt to be met with in Britiſh America, and afford a conſiderable ſupply of maſts, ſome from 20 to 30 inches in diameter, for the Britiſh navy.—*ib.*

John's, St, one of the Virgin Iſlands, about 12 leagues eaſt of Porto Rico. It is about 5 miles long and 1 broad; and 2 leagues ſouth of St Thomas. It is the beſt watered of all the Virgin Iſles; and its harbour, called Crawl Bay, is reckoned better than that of St Thomas, and paſſes for the beſt to the leeward of Antigua. There is, however, little good land in the iſland and its exportations are trifling.—*ib.*

John's, St, an iſland in the gulf of St Lawrence, near the northern coaſt of Nova-Scotia, to which government it is annexed. It is 117 miles in length from N. E. to S. W. The medium breadth is 20 miles; but between Richmond Bay on the north, and Halifax Bay on the ſouth, it is not above 3 miles broad. The other bays on the north ſide are London Harbour, Grand Raſtied, and St Peters; thoſe on the ſouth ſide, Egmont, Halifax, and Hillſborough. On the eaſt ſide, Three River Harbour, and Murry Harbour. It has ſeveral fine rivers, a rich ſoil, and is pleaſantly ſituated. Its capital is Charlotte-Town, the reſidence of the lieutenant-governor, who is the chief officer on the iſland. The number of inhabitants are eſtimated at about 5,000. Upon the reduction of Cape Breton in 1745, the inhabitants quietly ſubmitted to the Britiſh arms. While the French poſſeſſed this iſland, they improved it to ſo much advantage, as that it was called the granary of Canada, which it furniſhed with great plenty of corn, as well as beef and pork. When taken it had 10,000 head of black cattle upon it, and ſevera of the farmers raiſed 12,000 buſhels of corn annually. Its rivers abound with ſalmon, trout, and eels, and the ſurrounding ſea affords plenty of ſturgeon, plaice, and moſt kinds of ſhell-fiſh. The iſland is divided into 3 counties, viz. King's, Queen's, and Prince's counties; which are ſubdivided into 14 pariſhes, conſiſting of 27 townſhips, which in all make 1,363,400 acres, the contents of the iſland. The chief towns, beſides the capital, are Georgetown, Prince's-Town; beſides which are Hillſborough-Town, Pownal-Town, Maryborough-Town, &c. It lies between 45° 46′, and 47° 10 N. lat. and between 44° 22′, and 46° 32′ W. long.—*ib.*

John's, St, the north-weſternmoſt town in Suſſex county, Delaware, is ſituated at the head of the middle branch of Nanticoke river, about 27 miles N. E. of Vienna in Maryland, and 22 S. by W. of Dover.—*ib.*

John's, St, a town and fort in Lower Canada, ſituated on the weſt bank of Sorel river, at the north end of lake Champlain, a few miles ſouthward of Chamblee, 28 miles ſouthward of Montreal. It has been eſtabliſhed as the ſole port of entry and clearance for all goods imported from the interior of the United States into Canada, by an ordinance publiſhed by the executive council of Lower Canada, the 7th of July, 1796. It is 115 miles northward of Ticonderoga, and was taken by General Montgomery in Nov. 1775. N. lat. 45° 9′, W. long. 72° 18′.—*ib.*

John, St, a lake in Lower-Canada, which receives rivers from every direction, and ſends its waters through Saguenai river into the St Lawrence, at Tadouſac. It is about 25 miles each way.—*ib.*

John's Berkley, St, a pariſh of S. Carolina, in Charleſton diſtrict, containing 5,922 inhabitants; of whom 692 are whites, and 5,170 are ſlaves.—*ib.*

John's, St, a ſmall iſland in the Weſt-Indies belonging to Denmark, north of St Croix, and ſouth of Tortola, to which laſt it is very near. It is noted only for its fine harbour, which is ſaid to be ſufficient to contain in ſafety the whole Britiſh navy. It has a number of ſalt ponds, which, however, are no evidence of its fertility.—*ib.*

John's Colleton, St, a pariſh of S. Carolina, in Charleſton diſtrict, containing 5,312 inhabitants; of whom 585 are whites, and 4,705 ſlaves.—*ib.*

John's, St, the capital of the iſland of Antigua in the Weſt-Indies. It is a regularly built town, with a harbour of the ſame name, ſituated on the weſt ſhore, and on the north-eaſt ſide of Loblollo Bay. The entrance of the harbour is defended by Fort James. this town is the reſidence of the governor general of the leeward Charaibe Iſlands, and where the aſſembly is held, and the port where the greateſt trade is carried on. It was ſo flouriſhing as to receive a loſs by a ſtorm, to the value of £400,000 ſterling. N. lat. 17° 4′, W. long. 62° 4′.—*ib.*

John, St, or *Juan de Porto Rico*, the capital of the iſland of Porto Rico, in the Weſt-Indies.—*ib.*

JOHNSBURY, St, a townſhip in Caledonia county, in Vermont, bounded S. W. by Danville, and has 143 inhabitants.—*ib.*

JOHNSON FORT, in S. Carolina, lies on the N. E. ſide of James's Iſland, and ſouth of the city of Charleſton. It ſtands at the entrance of the harbour, and by which no veſſel can paſs unleſs the maſter or mate make oath that no malignant diſtemper is on board. It is guarded by 10 men.—*ib.*

JOHNSTON FORT, or *Johnſon Fort*, in N. Carolina, ſtands on the weſtern bank of Cape Fear river, oppoſite to the iſland on the ſea-coaſt whoſe ſouthern point is Cape Fear.—*ib.*

JOHNSONSBOROUGH, a poſt-town of New-Jerſey, 10 miles from Suſſex court-houſe.—*ib.*

Johnson's Landing-Place, is on O-yongwongyeh Creek, about 4 miles eaſtward of Fort Niagara.—*ib.*

Johnson, a county of N. Carolina, in Newbern diſtrict, bounded S. E. by Glaſgow, N. by Franklin and Wayne counties, and S. by Sampſon. It contains 5634 inhabitants, of whom 1329 are ſlaves.—*ib.*

JOHNSTOWN, a poſt-town and the capital of Montgomery county, New-York, ſituated on the N. bank of Mohawk river, 24 miles W. of Schenectady. The compact part of the town is a little back from the river, and contains about 70 houſes, a Preſbyterian and an Epiſcopal church, a court-houſe and gaol. In the townſhip 593 of the inhabitants are electors. Caghnawaga is a pariſh or diſtrict of Johnſtown 26 miles above Schenectady on the river. Settlements have been made here for about 80 years. Here ſtand the dwelling houſe, barn, and out-houſes (all of ſtone) formerly occupied by Sir William Johnſon. This ſettlement was moſtly deſtroyed by the Britiſh in the year 1780, who were joined by a party of Indians and others, under the command of Sir William Johnſon. In this action it is aſſerted, that Sir William evinced a want of feeling which would have diſgraced a ſavage. The people deſtroyed in this expedition were his old neighbours, with whom he had formerly lived in the habits of friendſhip. His eſtate was among them; and the inhabitants had always conſidered him as their friend. Theſe unfortunate people, after ſeeing their houſes and property conſumed, were hurried, ſuch as could walk, into cruel captivity; thoſe who could not, fell victims to the tomahawk and ſcalping knife.—*ib.*

JOHNSTON, a townſhip in Providence county, Rhode-Iſland, weſterly of the town of Providence, having 1320 inhabitants.—*ib.*

Johnston, a townſhip in Franklin county, in Vermont; it contains 93 inhabitants.—*ib.*

JONAS's SOUND, the moſt northern inlet on the weſtern coaſt of Sir Thomas Smith's Bay, lying near the arctic circle, in latitude 76°.—*ib.*

JONES (Sir William), who was ſtyled by Johnſon the moſt enlightened of men, was the ſon of William Jones, Eſq; one of the laſt of thoſe genuine mathematicians, admirers, and contemporaries of Newton, who cultivated and improved the ſciences in the laſt century. Our author was born on the 28th of September 1746, and received his education at Harrow ſchool, under the care of Dr Robert Sumner, whom he has celebrated in an eulogium which will out-laſt braſs or marble. We are told that he was a claſs fellow with Dr Parr, and at a very early age diſplayed talents which gave his tutor the moſt promiſing expectations, and which have ſince been amply juſtified. From Harrow he was ſent to Univerſity college, Oxford, where the rapidity and elegance of his literary acquiſitions excited general admiration; while a temper, ardently generous, and morals perfectly irreproachable, procured him teſtimonies of the moſt valuable eſteem. The grateful affection which he always cheriſhed for that venerable ſeat of learning, did as much honour to his ſenſibility, as Oxford herſelf has received by enrolling him among the number of her ſons.

In the twenty-third year of his age he travelled through France, and reſided ſome time at Nice, where he employed himſelf very differently from moſt other young men who make what is called the tour of Europe. *Man*, and the influence of various forms of *government*, were the principal objects of his inveſtigation; and in applying the reſult of his inquiries to the ſtate of his own country, he mingled the ſolicitudes of the Patriot with the honeſt partialities of an Engliſhman.

Mr Jones's firſt literary work was a tranſlation into French of a Perſian manuſcript, entitled "*Hiſtoire de Nadir Shah, connu ſous le nom de Thahmas Kuli Khan, Empereur de Perſe*," in two vols. 4to; the hiſtory of which performance we ſhall give in his own words:

INVOLUTION. PLATE XXXI.

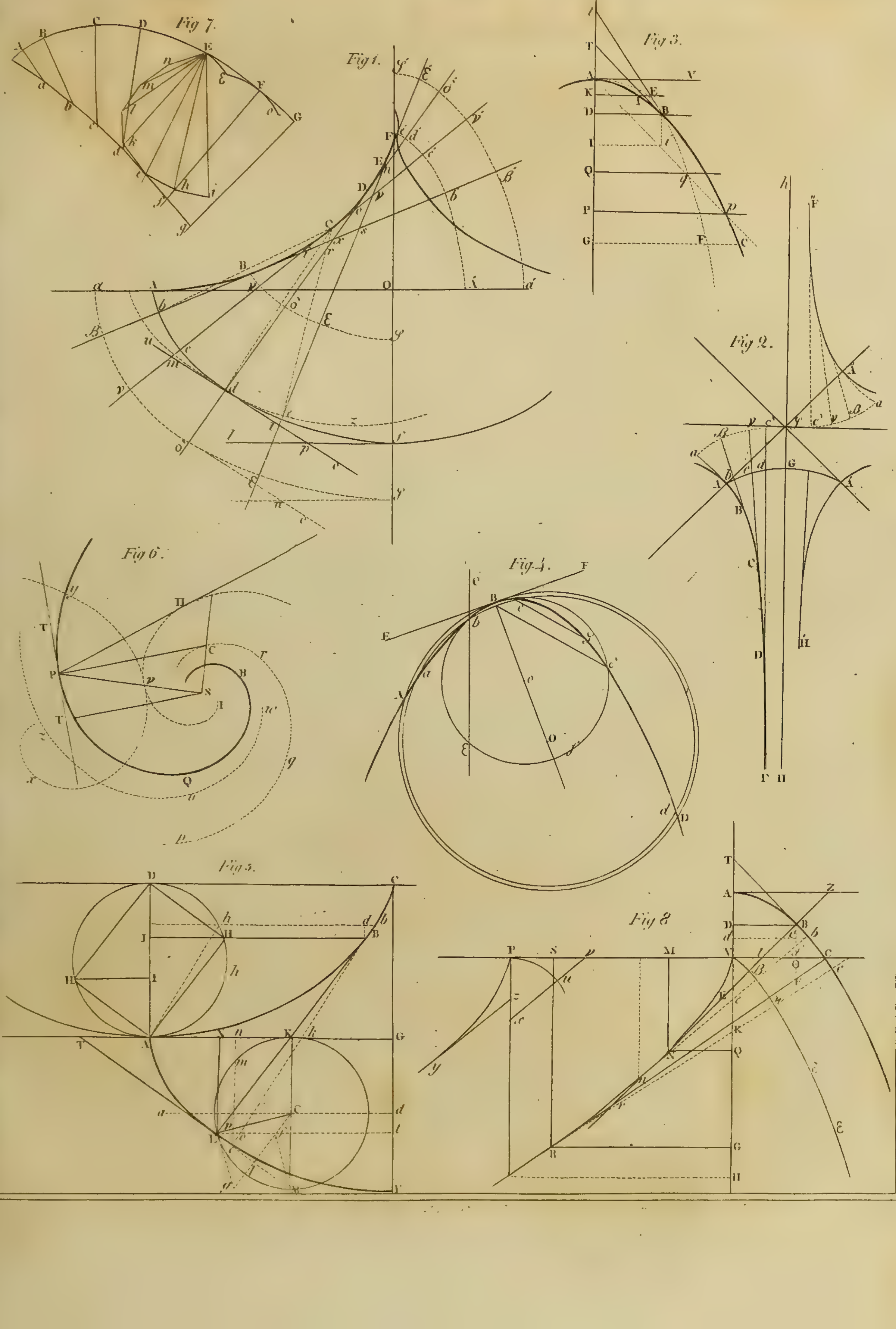


PLATE XXXII.

Fig 9.

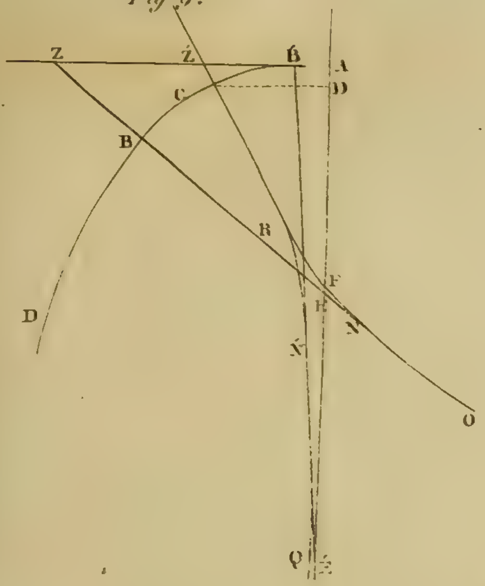


Fig 10.

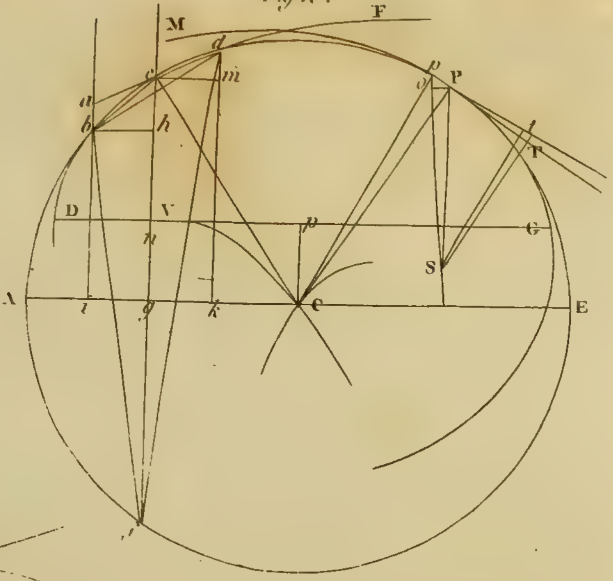


Fig 12.

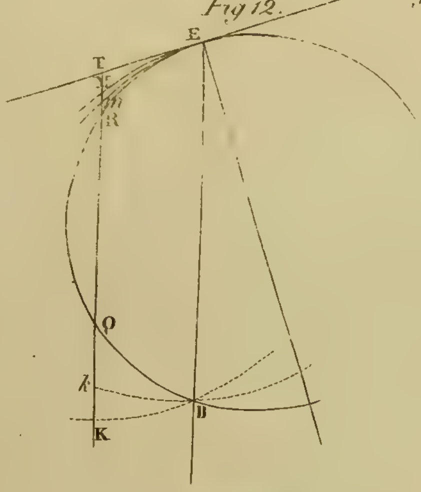


Fig 11.

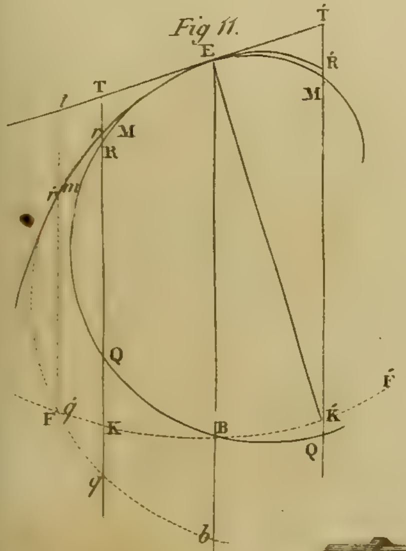
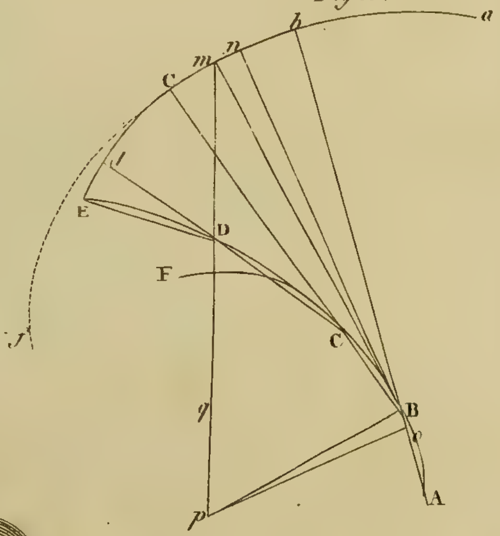
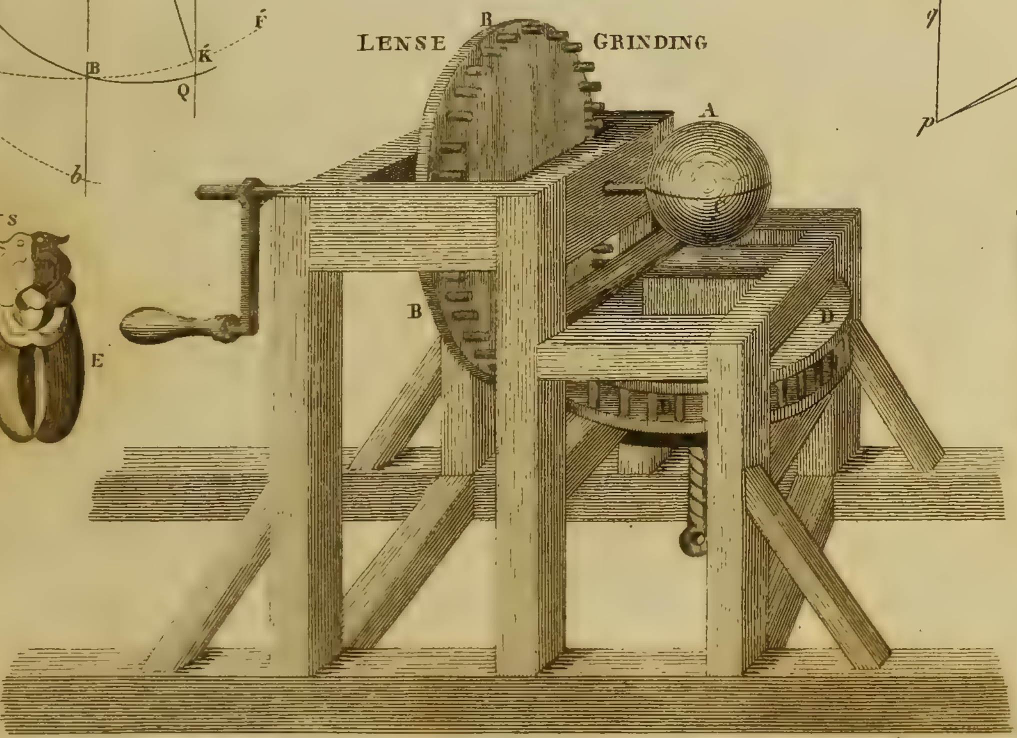


Fig 13.



LENSE GRINDING



ONISCUS

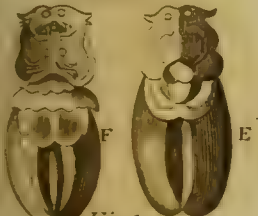


Fig 1.

ONISCUS

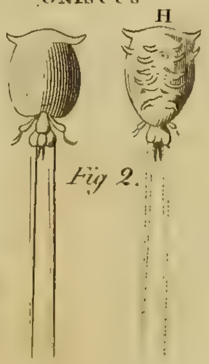


Fig 2.

words: "A great northern monarch, who viſited this country a few years ago, under the name of the Prince of Travendal, brought with him an eaſtern manuſcript, containing the life of Nadir Shah, the late ſovereign of Perſia, which he was deſirous of having tranſlated in England. The ſecretary of ſtate, with whom the Daniſh miniſter had converſed upon the ſubject, ſent the volume to me, requeſting me to give a literal tranſlation of it in the French language; but I wholly declined the taſk, alledging for my excuſe the length of the book, the dryneſs of the ſubject, the difficulty of the ſtyle, and chiefly my want both of leiſure and ability to enter upon an undertaking ſo fruitleſs and ſo laborious. I mentioned, however, a gentleman, with whom I had not then the pleaſure of being acquainted, but who had diſtinguiſhed himſelf by a tranſlation of a Perſian hiſtory, and was far abler than myſelf to ſatisfy the king of Denmark's expectations. The learned writer, who had other works upon his hands, excuſed himſelf on the account of his many engagements; and the application to me was renewed. It was hinted, that my compliance would be of no ſmall advantage to me at my entrance into life; that it would procure me ſome mark of diſtinction which might be pleaſing to me; and, above all, that it would be a reflection upon this country, if the king ſhould be obliged to carry the manuſcript into France. Incited by theſe motives, and principally by the laſt of them, unwilling to be thought churliſh or moroſe, and eager for the bubble reputation, I undertook the work, and ſent a ſpecimen of it to his Daniſh Majeſty; who returned his approbation of the ſtyle and method, but deſired that the whole tranſlation might be perfectly literal, and the oriental images accurately preſerved. The taſk would have been far eaſier to me, had I been directed to finiſh it in Latin; for the acquiſition of a French ſtyle was infinitely more tedious; and it was neceſſary to have every chapter corrected by a native of France, before it could be offered to the diſcerning eye of the public, ſince in every language there are certain peculiarities of idiom, and nice ſhades of meaning, which a foreigner can never learn to perfection. But the work, how arduous and unpleaſing ſoever, was completed in a year, not without repeated hints from the ſecretary's office that it was expected with great impatience by the Court of Denmark." The tranſlation of the Hiſtory of Nadir Shah was publiſhed in the ſummer of the year 1770, at the expence of the tranſlator; and forty copies upon large paper were ſent to Copenhagen; one of them bound with uncommon elegance for the king himſelf, and the others as preſents to his courtiers.*

* *Preface to the Hiſtory of Nadir Shah*, 1773.

What marks of diſtinction our author received, or what fruits he reaped for his labour, he has not thought proper to diſcloſe; but if any dependence is to be placed on common fame, the reward beſtowed upon him for this laborious taſk conſiſted only in the thanks of his Daniſh Majeſty, and the honour of being enrolled in the Royal Society of Copenhagen. That diſtinction was indeed accompanied with a letter, recommending the learned tranſlator to the patronage of his own ſovereign; but, in the interim, his friend Lord Dartmouth, who was to have delivered it, had reſigned his office of ſecretary of ſtate, and the letter, we are told, was never preſented.

There is reaſon to think, that this early and ſevere diſappointment made a deep impreſſion on his mind, and induced him to renounce the muſes for a time, and to apply himſelf with aſſiduity to the ſtudy of juriſprudence. This we think apparent, from the ſtyle in which he writes of his return from the continent, and of the death of his beloved preceptor Dr Sumner.

"When I left Nice, (ſays he) where I had reſided near ſeven months, and after traverſing almoſt all France, returned to England, I moſt ardently deſired to paſs ſeveral years more in the ſtudy of polite literature; as then, I thought, I might enter into public life, to which my ambition had always prompted me, more mature and prepared: but with this fruit of my leiſure, either fortune, or rather Providence, the diſpoſer of all human events, would not indulge my ſloth; for on a ſudden, I was obliged to quit that very literature to which, from my childhood, I had applied myſelf; and he who had been the encourager and aſſiſtant of my ſtudies, who had inſtructed, taught, formed me ſuch as I was, or if I am any thing at all, Robert Sumner, within a year after my return, was ſnatched away by an untimely death (a)."

(a) As a ſpecimen of our author's latinity, we ſubjoin the epitaph on Dr Sumner, which is affixed to the wall of the ſouth tranſept of Harrow church.

H. S. E.
ROBERTUS SUMNER, S. T. P.
Collegii Regalis apud Cantab. olim Socius,
Scholæ Harrovienſis haud ita pridem Archididaſcalus.
Fuit hoc præſtantiſſimo Viro
Ingenium naturâ peracre, optimarum diſciplinis artium ſedulo
Excultum, uſu diuturno confirmatum, & quodammodo ſubactum.
Nemo enim aut in reconditis ſapientiæ ſtudiis illo ſubtilior extitit,
Aut humanioribus literis limatior: nemini fere vel felicius
Contigit judicii acumen, vel uberior eruditionis copia.
Egregiis hiſce cum dotibus naturæ, tum doctrinæ ſubſidiis,
Inſuper accedebat in ſcriptis mira ac prope perfecta eloquentia.
In ſermone facetiarum lepor plane Atticus, & gravitate ſuaviter
Aſpera urbanitas; in moribus ſingularis quædam integritas & fides;
Vitæ denique ratio conſtans ſibi, & ad virtutis normam diligenter ſevereque,
Exculta. Omnibus qui vel amico eſſent eo, vel magiſtro uſi, doctrinæ,
Ingenii, virtutis triſte reliquit deſiderium, ſubitâ, eheu! atque immaturâ
Morte correptus prid. Id. Sept. A. D.
1771, Æt. 41.

In 1771 Mr Jones publiſhed *Diſſertation ſur la Literature Orientale*, 8vo, and this was followed by *Lettre à Monſieur A** Du P***, dans laquelle eſt compris l' Examen de ſa Traduction des Livres attribues à Zoroaſtre*, 8vo. The diſſertation offered a favourable ſpecimen of the author's abilities as a linguiſt and as a critic; and the letter contained a ſpirited vindication of the univerſity of Oxford, from the very ſcurrilous reproaches, in which its incompetency in Oriental literature was aſſerted by the illiberal tranſſlator of the ſuppoſed works of the Perſian philoſopher.

In the ſame year he gave to the public, "A Grammar of the Perſian language," 4to, and at the ſame time propoſed to republiſh Meninſki's Dictionary, with improvements from *De Labroſſee's Gazophylacium Linguæ Perſarum*, and to add in their proper place an Appendix ſubjoined to Gehanaguire's Perſic Dictionary. The Grammar has been found extremely uſeful, and has been reprinted ſeveral times; but the deſign of the Dictionary, though an object of even national importance, for want of due encouragement was obliged to be laid aſide.

In 1772 he publiſhed "Poems; conſiſting chiefly of Tranſlations from the Aſiatic Languages. To which are added two Eſſays; 1. On the Poetry of the Eaſtern Nations. 2. On the Arts commonly called Imitative," 8vo, which in 1777 he republiſhed with the addition of ſome Latin Poems, every way worthy of their author. On the 18th June 1773, he took the degree of Maſter of Arts, and the ſame year publiſhed "The Hiſtory of the Life of Nadir Shah, King of Perſia. Extracted from an Eaſtern Manuſcript, which was tranſlated into French by order of his Majeſty the King of Denmark. With an Introduction, containing, 1. A Deſcription of Aſia according to the Oriental Geographers. 2. A ſhort Hiſtory of Perſia from the earlieſt Times to the preſent Century: And an Appendix, conſiſting of an Eſſay on Aſiatic Poetry, and the Hiſtory of the Perſian Language. To which are added Pieces relative to the French Tranſlation," 8vo. Our author having at this period determined to ſtudy the law as a profeſſion, and to relinquiſh every other purſuit, our readers will not be diſpleaſed with the following extract, relating to this reſolution, which concludes the preface to the hiſtory now under conſideration:

"To conclude; if any eſſential miſtakes be detected in this whole performance, the reader will excuſe them, when he reflects upon the great variety of dark and intricate points which are diſcuſſed in it; and if the obſcurity of the ſubject be not a ſufficient plea for the errors which may be diſcovered in the work, let it be conſidered, to uſe the words of Pope in the preface to his juvenile poems, that there are very few things in this collection which were not written under the age of five-and-twenty: moſt of them indeed were compoſed in the intervals of my leiſure in the South of France, before I had applied myſelf to a ſtudy of a very different nature, which it is now my reſolution to make the ſole object of my life. Whatever then be the fate of this production, I ſhall never be tempted to vindicate any part of it which may be thought exceptionable; but ſhall gladly reſign my own opinions, for the ſake of embracing others, which may ſeem more probable; being perſuaded, that nothing is more laudable than the love of truth, nothing more odious than the obſtinacy of perſiſting in error. Nor ſhall I eaſily be induced, when I have diſburdened myſelf of two other pieces which are now in the preſs, to begin any other work of the literary kind; but ſhall confine myſelf wholly to that branch of knowledge in which it is my chief ambition to excel. It is a painful conſideration, that the profeſſion of literature, by far the moſt laborious of any, leads to no real benefit or true glory whatſoever. Poetry, ſcience, letters, when they are not made the ſole buſineſs of life, may become its ornaments in proſperity, and its moſt pleaſing conſolation in a change of fortune; but if a man addicts himſelf entirely to learning, and hopes by that, either to raiſe a family, or to acquire, what ſo many wiſh for, and ſo few ever attain, an honourable retirement in his declining age, he will find, when it is too late, that he has miſtaken his path; that other labours, other ſtudies, are neceſſary; and that unleſs he can aſſert his own independence in active life, it will avail him little to be favoured by the learned, eſteemed by the eminent, or recommended even by kings. It is true, on the other hand, that no external advantages can make amends for the loſs of virtue and integrity, which alone give a perfect comfort to him who poſſeſſes them. Let a man, therefore, who wiſhes to enjoy, what no fortune or honour can beſtow, the bleſſing of ſelf-approbation, aſpire to the glory given to Pericles by a celebrated hiſtorian, of being acquainted with all uſeful knowledge, of expreſſing what he knows with copiouſneſs and freedom, of loving his friends and country, and of diſdaining the mean purſuits of lucre and intereſt: this is the only career on which an honeſt man ought to enter, or from which he can hope to gain any ſolid happineſs."

The next year he publiſhed *Poeſeos Aſiaticæ Commentariorum Libri Sex, cum Appendice: ſubjicitur Limon, ſeu Miſcellaneorum Liber*, 8vo; and purſuing his purpoſe of applying to the ſtudy of the law, we hear no more of him from the preſs (except the new edition of his Poems), until the year 1779. In this interval he was called to the bar, and attended Weſtminſter hall and the Oxford circuit, where he obtained but little buſineſs. He was however appointed a commiſſioner of bankrupts by Lord Bathurſt, who is ſuppoſed to have intended to exert his intereſt to procure his nomination to the bench in the Eaſt Indies.

He publiſhed in this year, "The ſpeeches of Iſeus, in cauſes concerning the law of ſucceſſion to property at Athens; with a preparatory diſcourſe, notes critical and hiſtorical, and a Commentary, 4to." In this valuable work, the talents of the ſcholar, the critic, and the lawyer, combine to elucidate a very important part of juriſprudence; for, "though deep reſearches into the legal antiquities of *Greece* and *Rome* (as he obſerves in his Commentary) are of greater uſe to ſcholars and contemplative perſons, than to lawyers and men of buſineſs; though Bracton and Lyttleton, Coke and Rolle, are the proper objects of our ſtudy; yet the ableſt advocates, and wiſeſt judges, have frequently embelliſhed their arguments with learned alluſions to ancient caſes; and ſuch alluſions, it muſt be allowed, are often uſeful, always ornamental;

and, when they are introduced without pedantry, never fail to pleaſe." The work was dedicated in a ſtyle of reſpectful gratitude to his patron Lord Bathurſt.

In the year 1780, we find our author a candidate to repreſent in parliament the univerſity of Oxford. He had for ſome time reſided but little in the univerſity, and therefore laboured under ſome diſadvantages; but he did not meanly court the ſupport of any man. In a paper, which was circulated on that occaſion, his friends, who were numerous, declare, that they have "neither openly ſolicited, nor intend openly to ſolicit, votes for Mr Jones within the Univerſity itſelf, becauſe he will never become the inſtrument of diſturbing the calm ſeat of the Muſes, by conſenting to any ſuch ſolicitation for himſelf or for any man whatever. His own applications have been, are, and will be, confined to thoſe only who have profeſſed a regard for him, *and who have no votes themſelves:* the Maſters of Arts in a great univerſity, whoſe prerogative is cool reaſon and impartial judgment, muſt never be placed on a level with the voters of a borough, or the freeholders of a county. Even in proceeding thus far, he does not ſet the example, but follows it; and his friends would never have printed any paper, if they had not thought themſelves juſtified by the conduct of others.

"For the firſt and the laſt time, they beg leave to ſuggeſt, that no exertions muſt be ſpared by thoſe who, either perſonally or by reputation, approve the character of Mr Jones; into which, both literary and political, as well as moral, his friends deſire and demand the ſtricteſt ſcrutiny. For his univerſity he began early to provoke, and poſſibly to incur, the diſpleaſure of great and powerful men: For his univerſity he entered the liſts with a foul-mouthed and arrogant Frenchman, who had attacked Oxford in three large volumes of miſrepreſentation and ſcurrility: For his univerſity he reſigned, for a whole year, his favourite ſtudies and purſuits, to ſave Oxford the diſcredit of not having one of her ſons ready to tranſlate a tedious Perſian manuſcript. To Oxford, in ſhort, he is known to be attached by the ſtrongeſt poſſible ties; and only regrets the neceſſity of abſenting himſelf from the place in which of all others he moſt delights, until the event of the preſent competition ſhall either convince him that he has toiled in vain as a man of letters, or ſhall confer on him the greateſt reward to which he can aſpire. The unavoidable diſadvantage of being ſo late propoſed, and the reſpectable ſupport with which he is now honoured, will ſecure him in all events from the leaſt diſgrace." The application was unſucceſsful, chiefly becauſe his own college had fixed upon another candidate, from a perſuaſion that the immediate appointment of Mr Jones to a ſeat, then vacant on the bench of judges in India, was morally certain.

The riots of that year gave occaſion to another publication of our author, entitled, "An Inquiry into the legal Mode of ſuppreſſing Riots; with a conſtitutional Plan of future Defence," 8vo; and in 1781 he publiſhed "An Eſſay on the Law of Bailments," 8vo, a very maſterly treatiſe, which did great honour to his legal abilities. In this laſt work he inculcates the neceſſity of deeply exploring the grounds of the common law; and ſpeaking of Blackſtone, (he ſays) "his commentaries are the moſt correct and beautiful outline that ever was exhibited of any human ſcience; but they alone will no more form a lawyer, than a general map of the world, how accurately and elegantly ſoever it may be delineated, will make a geographer."

In this year he likewiſe recalled his muſe in an Ode on the nuptials of Lord Viſcount Althorpe, who had been his pupil, to Miſs Lavinia Bingham. This beautiful little poem is preſerved in the European Magazine for January 1785, and we think in other periodical publications.

From many circumſtances which might be collected together, it would appear that our author at this juncture did not coincide in opinion with thoſe who had the direction of government, nor did he approve the meaſures at that period adopted.—With theſe ſentiments he ſeems to have been ſelected as a proper perſon to be introduced as a member of the Conſtitutional Society. Could he have foreſeen the degeneracy of ſuch aſſociations, there is reaſon to believe that he would have declined what he condeſcended to accept as an honour; for though an ardent friend to liberty, he was an enemy to theoretical innovation, and declares, in a letter to the ſecretary, that by the term conſtitution, he underſtands "the great ſyſtem of public, in contradiction to private and criminal law, which compriſes all thoſe articles which Blackſtone arranges, in his firſt volume, under the rights of perſons, and of which he gives a perſpicuous analyſis. Whatever then relates to the rights of perſons, either abſolute rights, as the enjoyment of liberty, ſecurity, and property, or relative, that is, in the public relations of magiſtrates and people, makes a part of that majeſtic whole, which we properly call the conſtitution. This conſtitutional or public law is partly unwritten, and grounded upon immemorial uſage, and partly written or enacted by the legiſlative power; but the unwritten, or common law, contains the true ſpirit of our conſtitution: the written has often moſt unjuſtifiably altered the form of it; the common law is the collected wiſdom of many centuries, having been uſed and approved by ſucceſſive generations; but the ſtatutes frequently contain the whims of a few leading men, and ſometimes of the mere individuals employed to draw them."

In 1782 he publiſhed "The Mahomedan Law of Succeſſion to the Property of Inteſtates, in Arabic, with a verbal Tranſlation and explanatory Notes." 4to.

At length the poſt of one of the judges in the Eaſt Indies, which had been kept vacant five years, was determined upon being filled up; and our author, on the 4th March 1783, was appointed to that ſtation, and on the 20th received the honour of knighthood. On the 8th of April he married Miſs Shipley, eldeſt daughter of the Biſhop of St Aſaph, and almoſt immediately embarked for the Indies. He had previouſly publiſhed "The Moallakat; or, Seven Arabian Poems, which were ſuſpended on the Temple at Mecca, with a Tranſlation and Arguments." 4to. To this it was intended to add a preliminary diſcourſe and notes.—The former to compriſe obſervations on the antiquity of the Arabian language and letters; on the dialects and characters of Himyar and Koraiſh, with accounts of ſome Himyarick poets; on the manners of the Arabs in the age immediately preceding that of Mahomed; on the temple at Mecca, and the Moallakat, or pieces of poetry ſuſpended on its walls or gate; laſtly, on the lives of the Seven Poets, with a critical hiſtory of their works, and the various copies or editions of them preſerved in Europe, Aſia, and Africa. The latter to contain authorities and reaſons for the tranſlation of controverted paſſages; to elucidate all the obſcure couplets, and exhibit or propoſe amendments of the text; to direct the reader's attention to particular beauties, or point out remarkable defects; and to throw light on the images, figures, and alluſions of the Arabian poets, by citations either from writers of their own country, or from ſuch of our European travellers as beſt illuſtrate the ideas and cuſtoms of Eaſtern nations. This diſcourſe and the notes have not yet appeared. At his departure for the eaſtern world, he left, in manuſcript, with his brother-in-law the Dean of St Aſaph, a little tract, entitled "The Principles of Government, in a Dialogue between a Scholar and a Peaſant." This celebrated dialogue being afterwards publiſhed by the Dean, and widely circulated by the ſociety for conſtitutional information, the Dean was proſecuted for publiſhing a libel, and, if our memory deceives us not, was found guilty.

Sir William Jones now dropt for ever all concern in party politics, and applied himſelf to purſuits more worthy of his talents. During his voyage to India, he conceived the idea of the Aſiatic Society, of which an account has been given under the title SOCIETIES (*Encycl.*), and of whoſe reſearches five volumes, replete with much curious information, are now before the public. But ardently as his mind was attached to general literature and ſcience, he was by no means inattentive to the profeſſional duties of his high ſtation. He had indeed, to uſe his own expreſſion, an "undiſſembled fondneſs for the ſtudy of juriſprudence *;" and in the character of a judge, diſplayed the profound knowledge and irreproachable integrity, which, before his promotion, pervaded his reaſonings as a lawyer, and governed his conduct as a man. Unfortunately the intenſe ardour of application, which produced his frequent contributions to the ſtock of human knowledge, added to the unfavourable influence of the climate, greatly impaired his health. On this account, after a reſidence of about fifteen years in India, he made preparations for returning to England; but death interpoſed; and this illuſtrious ornament of ſcience and virtue was taken from the world on the 27th of April 1794, in the 48th year of his age. "It is to the ſhame of ſcepticiſm (as one of his biographers well obſerves), to the encouragement of hope, and to the honour of genius, that this great man was a ſincere believer in the doctrines of Chriſtianity, and that he was found in his cloſet in the attitude of addreſſing his prayer to God." We ſhall give his character as it was drawn by Sir John Shore, Baronet, (now Lord Teignmouth) in a diſcourſe delivered at a meeting of the Aſiatic Society, held on the 22d of May 1794.

"His capacity for the acquiſition of languages has never been excelled. In Greek and Roman literature, his early proficiency was the ſubject of admiration and applauſe; and knowledge of whatever nature, once obtained by him, was ever afterwards progreſſive. The more elegant dialects of modern Europe, the French, the Spaniſh, and Italian, he ſpoke and wrote with the greateſt fluency and preciſion; and the German and Portugueſe were familiar to him. At an early period of life his application to Oriental literature commenced; he ſtudied the Hebrew with eaſe and ſucceſs; and many of the moſt learned Aſiatics have the candour to avow, that his knowledge of Arabic and Perſian was as accurate and extenſive as their own; he was alſo converſant in the Turkiſh idiom, and the Chineſe had even attracted his notice ſo far as to induce him to learn the radical characters of that language, with a view perhaps to farther improvements. It was to be expected, after his arrival in India, that he would eagerly embrace the opportunity of making himſelf maſter of the Sanſcrit; and the moſt enlightened profeſſors of the doctrines of Brahma confeſs with pride, delight, and ſurpriſe, that his knowledge of their ſacred dialect was moſt critically correct and profound. The Pandits, who were in the habit of attending him, could not, after his death, ſuppreſs their tears for his loſs, nor find terms to expreſs their admiration at the wonderful progreſs he had made in their ſciences.

"Before the expiration of his twenty-ſecond year, he had completed his Commentaries on the Poetry of the Aſiatics, although a conſiderable time afterwards elapſed before their publication; and this work, if no other monument of his labours exiſted, would at once furniſh proofs of his conſummate ſkill in the Oriental dialects, of his proficiency in thoſe of Rome and Greece, of taſte and erudition far beyond his years, and of talents and application without example.

"But the judgment of Sir William Jones was too diſcerning to conſider language in any other light than as the key of ſcience, and he would have deſpiſed the reputation of a mere linguiſt. Knowledge and truth were the objects of all his ſtudies, and his ambition was to be uſeful to mankind; with theſe views he extended his reſearches to all languages, nations, and times.

"Such were the motives that induced him to propoſe to the government of India, what he juſtly denominated a work of national utility and importance, the compilation of a copious Digeſt of Hindu and Mahomedan Law, from Sanſcrit and Arabic originals, with an offer of his ſervices to ſuperintend the compilation, and with a promiſe to tranſlate it. He had foreſeen, previous to his departure from Europe, that without the aid of ſuch a work, the wiſe and benevolent intentions of the legiſlature of Great Britain, in leaving to a certain extent the natives of theſe provinces in poſſeſſion of their own laws, could not be completely fulfilled; and his experience, after a ſhort reſidence in India, confirmed what his ſagacity had anticipated, that without principles to refer to, in a language familiar to the judges of the courts, adjudications amongſt the natives muſt too often be ſubject to an uncertain and erroneous expoſition, or wilful miſinterpretation of their laws.

"To the ſuperintendance of this work, which was immediately undertaken at his ſuggeſtion, he aſſiduouſly devoted thoſe hours which he could ſpare from his profeſſional duties. After tracing the plan of the Digeſt, he preſcribed its arrangement and mode of execution, and ſelected from the moſt learned Hindus and Mahomedans fit perſons for the taſk of compiling it: flattered by his attention, and encouraged by his applauſe, the Pandits proſecuted their labours with cheerful zeal to a ſatisfactory concluſion. The Molavees have alſo nearly finiſhed their portion of the work; but we muſt ever regret, that the promiſed tranſlation, as well as the meditated preliminary diſſertation, have been fruſtrated by that decree, which ſo often intercepts the performance of human purpoſes.

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* *Law of Bailments.*

“ During the courſe of this compilation, and as auxiliary to it, he was led to ſtudy the works of Menu, reputed by the Hindus to be the oldeſt and holieſt of legiſlators; and finding them to compriſe a ſyſtem of religious and civil duties, and of law in all its branches, ſo comprehenſive and minutely exact, that it might be conſidered as the inſtitutes of Hindu Law, he preſented a tranſlation of them to the government of Bengal. During the ſame period, deeming no labour exceſſive or ſuperfluous that tended in any reſpect to promote the welfare or happineſs of mankind, he gave the public an Engliſh verſion of the Arabic Text of the Sirajiyah or Mahomedan Law of Inheritance, with a Commentary. He had already (as has been obſerved) publiſhed in England a tranſlation of a tract on the ſame ſubject by another Mahomedan lawyer, containing, as his own words expreſs, ‘a lively and elegant Epitome of the Law of Inheritance of Zaid.’

“ To theſe learned and important works, ſo far out of the road of amuſement, nothing could have engaged his application but that deſire which he ever profeſſed, of rendering his knowledge uſeful to his nation, and beneficial to the inhabitants of theſe provinces.

“ I ſhould ſcarcely (continues Lord Teignmouth) think it of importance to mention, that he did not diſdain the office of editor of a Sanſcrit and Perſian work, if it did not afford me an opportunity of adding, that the latter was publiſhed at his own expence, and was ſold for the benefit of inſolvent debtors. A ſimilar application was made of the produce of Sirajiyah.”

But nothing exhibits the large graſp of Sir William Jones's mind in ſo ſtriking a point of view as a paper in his own hand writing, which came into Lord Teignmouth's poſſeſſion after his death. It was intitled DESIDERATA, and propoſed for inveſtigation the following ſubjects relating to the eaſtern world.

India.—1. The ancient geography of India, &c. from the Puranas. 2. A botanical deſcription of Indian plants, from the Coſhas, &c. 3. A grammar of the Sanſcrit language, from Panini, &c. 4. A dictionary of the Sanſcrit language, from the 32 original vocabularies and Niructi. 5. On the ancient muſic of the Indians. 6. On the medical ſubſtances of India, and the Indian art of medicine. 7. On the philoſophy of the ancient Indians. 8. A tranſlation of the Veda. 9. On ancient Indian geometry, aſtronomy, and algebra. 10. A tranſlation of the Puranas. 11. A tranſlation of the Mahabbara and Ramayan. 12. On the Indian theatre, &c. &c. 13. On the Indian conſtellations, with their mythology, from the Puranas. 14. The hiſtory of India before the Mahomedan conqueſt, from the Sanſcrit Caſhmir Hiſtories.

Arabia.—15. The hiſtory of Arabia before Mahomed. 16. A tranſlation of the Hamaſa. 17. A tranſlation of Hariri. 18. A tranſlation of the Facabatul Khulaſa. Of the Caſiah.

Perſia—19. The hiſtory of Perſia, from authorities in Sanſcrit, Arabic, Greek, Turkiſh, Perſian ancient and modern, Firdauſi's Khroſrau nama. 20. The five poems of Nizami, tranſlated in proſe. 21. A dictionary of pure Perſian Je-changire.

China.—22. A tranſlation of Shi-cing. 23. The text of Can-fu-tſu, verbally tranſlated.

Tartary.—24. A hiſtory of the Tartar nations, chiefly of the Moguls and Othmans, from the Turkiſh and Perſian.

“ We are not authoriſed (ſays his Lordſhip) to conclude, that he had himſelf formed a determination to complete the works which his genius and knowledge had thus ſketched; the taſk ſeems to require a period beyond the probable duration of any human life; but we, who had the happineſs to know Sir William Jones; who were witneſſes of his indefatigable perſeverance in the purſuit of knowledge, and of his ardour to accompliſh whatever he deemed important; who ſaw the extent of his intellectual powers, his wonderful attainments in literature and ſcience, and the facility with which all his compoſitions were made—cannot doubt, if it had pleaſed Providence to protract the date of his exiſtence, that he would have ably executed much of what he had ſo extenſively planned.”

We have already enumerated attainments and works which, from their diverſity and extent, ſeem far beyond the capacity of the moſt enlarged minds; but the catalogue may yet be augmented. To a proficiency in the languages of Greece, Rome, and Aſia, he added the knowledge of the philoſophy of thoſe countries, and of every thing curious and valuable that had been taught in them. The doctrines of the Academy, the Lyceum, or the Portico, were not more familiar to him than the tenets of the Vedas, the myſticiſm of the Sufis, or the religion of the ancient Perſians; and whilſt, with a kindred genius, he peruſed with rapture the heroic, lyric, or moral compoſitions of the moſt renowned poets of Greece, Rome, and Aſia, he could turn with equal delight and knowledge to the ſublime ſpeculations or mathematical calculations of Barrow and Newton. With them alſo he profeſſed his conviction of the truth of the Chriſtian religion; and he juſtly deemed it no inconſiderable advantage, that his reſearches had corroborated the multiplied evidence of Revelation, by confirming the Moſaic account of the primitive world.

In his eighth anniverſary diſcourſe to the Aſiatic Society, he thus expreſſes himſelf: “ Theological inquiries are no part of my preſent ſubject; but I cannot refrain from adding, that the collection of tracts which we call, from their excellence, the Scriptures, contain, independently of a divine origin, more true ſublimity, more exquiſite beauty, purer morality, more important hiſtory, and finer ſtrains both of poetry and eloquence, than could be collected within the ſame compaſs from all other books that were ever compoſed in any age, or any idiom. The two parts, of which the Scriptures conſiſt, are connected by a chain of compoſitions, which bear no reſemblance in form or ſtyle to any that can be produced from the ſtores of Grecian, Indian, Perſian, or even Arabian learning; the antiquity of theſe compoſitions no man doubts, and the unſtrained application of them to events long ſubſequent to their publication, is a ſolid ground of belief that they were genuine predictions; and conſequently inſpired.”

There were, in truth, few ſciences in which he had not acquired conſiderable proficiency; in moſt, his knowledge was profound. The theory of muſic was familiar to him; nor had he neglected to make himſelf acquainted with the intereſting diſcoveries lately made in chemiſtry; "and I have heard him (ſays Lord Teignmouth) aſſert, that his admiration of the ſtructure of the human frame had induced him to attend for a ſeaſon to a courſe of anatomical lectures, delivered by his friend the celebrated Hunter."

His laſt and favourite purſuit was the ſtudy of botany, which he originally began under the confinement of a ſevere and lingering diſorder, which with moſt minds would have proved a diſqualification from any application. It conſtituted the principal amuſement of his leiſure hours. In the arrangements of Linnæus, he diſcovered ſyſtem, truth, and ſcience, which never failed to captivate and engage his attention; and from the proofs which he has exhibited of his progreſs in botany, we may conclude that he would have extended the diſcoveries in that ſcience.

It cannot be deemed uſeleſs or ſuperfluous to inquire by what arts or method he was enabled to attain to a degree of knowledge almoſt univerſal, and apparently beyond the powers of man, during a life little exceeding 47 years.

The faculties of his mind, by nature vigorous, were improved by conſtant exerciſe; and his memory, by habitual practice, had acquired a capacity of retaining whatever had once been impreſſed upon it. To an unextinguiſhed ardour for univerſal knowledge, he joined a perſeverance in the purſuit of it which ſubdued all obſtacles; his ſtudies began with the dawn, and, during the intermiſſions of profeſſional duties, were continued throughout the day; reflection and meditation ſtrengthened and confirmed what induſtry and inveſtigation had accumulated. It was a fixed principle with him, from which he never voluntarily deviated, not to be deterred by any difficulties that were ſurmountable from proſecuting to a ſucceſsful termination what he had once deliberately undertaken.

But what appeared more particularly to have enabled him to employ his talents ſo much to his own and the public advantage, was the regular allotment of his time, and a ſcrupulous adherence to the diſtribution which he had fixed; hence all his ſtudies were purſued without interruption or confuſion. He collected information, too, from every quarter; juſtly concluding, that ſomething might be learned from the illiterate, to whom he liſtened with the utmoſt candour and complacency.

Lord Teignmouth, addreſſing himſelf to the Aſiatic Society, ſays, "Of the private and ſocial virtues of our lamented Preſident, our hearts are the beſt records. To you who knew him, it cannot be neceſſary for me to expatiate on the independence of his integrity, his humanity, probity, or benevolence, which every living creature participated; on the affability of his converſation and manners, or his modeſt, unaſſuming deportment: nor need I remark, that he was totally free from pedantry, as well as from arrogance and ſelf-ſufficiency, which ſometimes accompany and diſgrace the greateſt abilities. His preſence was the delight of every ſociety, which his converſation exhilarated and improved; and the public have not only to lament the loſs of his talents and abilities, but that of his example.

"To him, as the founder of our inſtitution, and whilſt he lived its firmeſt ſupport, our reverence is more particularly due. Inſtructed, animated, and encouraged by him, genius was called forth into exertion, and modeſt merit was excited to diſtinguiſh itſelf. Anxious for the reputation of the Society, he was indefatigable in his own endeavours to promote it, whilſt he cheerfully aſſiſted thoſe of others. In loſing him, we have not only been deprived of our brighteſt ornament, but of the guide and patron, on whoſe inſtructions, judgment, and candour, we could implicitly rely." Though theſe are the ſentiments, not only of Lord Teignmouth, but, we believe, of every man of letters, we truſt there is ſtill left in Bengal a ſufficient love of letters and of ſcience to carry on the plan which was formed by the genius of Sir William Jones.

JONES, a county of N. Carolina, in Newbern diſtrict, bounded N. by Craven. It contains 3141 free inhabitants, and 1681 ſlaves. It is well watered by Trent river, and its tributary ſtreams. Chief town Trenton.—*Morſe.*

JONESBOROUGH, a poſt-town, and chief town of Waſhington diſtrict in Tenneſſee, is the ſeat of the diſtrict and county courts. It has but few houſes, having been but lately eſtabliſhed. It is 26 miles from Greenville, 101 from Knoxville, 40 from Abingdon in Virginia, and 627 from Philadelphia.—*ib.*

Jonesborough, the chief town of Camden county in Edenton diſtrict, N. Carolina. It contains a court-houſe and a few dwelling-houſes.—*ib.*

JONES's PLANTATION, in Lincoln county, Maine, was incorporated by the name of Harlem, in February, 1796. It is 19 miles N. E. of Hallowell, 47 from Pownalborough, and 213 N. E. by N. of Boſton. It contains 262 inhabitants.—*ib.*

Jones's Ford, on Brandywine creek, is 5 or 6 miles above Chad's Ford, in Pennſylvania.—*ib.*

JONESIA, is a very handſome middling-ſized ramous tree, found in gardens about Calcutta. In the Sanſcrit it is called *Aſ' ōca*, and in the Bengaleſe *Ruſſuck*; but the name Joneſia was given to it by the Aſiatic Society, who conſecrated it to the memory of their firſt preſident Sir William Jones. It is thus deſcribed by Dr Roxburgh, a member of that ſociety:

"*Calyx*, two leaved, corol, one petaled, piſtil-bearing; baſe of the tube impervious; ſtamens long, aſcending, inſerted into the margin of a glandulous nectarial ring, which crowns the mouth of the tube, the uppermoſt two of which more diſtant; ſtyle declining. *Legume* turgid. *Trunk* erect, though not very ſtraight. *Bark* dark brown, pretty ſmooth. *Branches* numerous, ſpreading in every direction, ſo as to form a moſt elegant ſhady head. *Leaves* alternate, abruptly feathered, ſeſſile, generally more than a foot long; when young pendulous and coloured. *Leaflets* oppoſite, from four to ſix pair, the lowermoſt broad lanced, the upper lanced; ſmooth, ſhining, firm, a little waved, from four to eight inches long. *Petiole* common, round, and ſmooth. *Stipule* axillary, ſolitary; in fact a proceſs from the baſe of the common petiole, as in many of the graſſes and monandriſts, &c. *Umbels* terminal and axillary; between the ſtipule and branchlet, globular, crowded, ſubſeſſile, erect. *Bracts*, a ſmall hearted one under each diviſion of the umbel. *Peduncle* and pedicels ſmooth, coloured. *Flowers* very numerous, pretty large; when they firſt expand they are of a beautiful orange colour, gradually changing to red, forming a variety of lovely ſhades; fragrant during the night. *Calyx* perianth, below two-leaved, leaflets ſmall, nearly oppoſite, coloured, hearted, bracte-like, marking the termination of the pedicel, or beginning of the tube of the corol. *Corol* one-petalled, funnel-form; tube ſlightly incurved, firm, and fleſhy, tapering towards the baſe (club funnel-ſhaped) and there impervious; border four-parted; diviſion ſpreading, ſuborbicular; margins moſt ſlightly woolly: one-third the length of the tube. *Nectary*, a ſtameniferous and piſtiliferous ring crowns the mouth of the tube. *Stamens*, filaments generally ſeven; and ſeven muſt, I think, be the natural number; viz. three on each ſide, and one below, above a vacancy, as if the place of an eighth filament, and is occupied on its inſide by the piſtil; they are equal, diſtinct, aſcending, from three to four times longer than the border of the corol. *Anthers* uniform, ſmall, incumbent. *Piſtil*, germ oblong, pediceled; pedicel inſerted into the inſide of the nectary, immediately below the vacant ſpace already mentioned; ſtyle nearly as long as the ſtamens, declining; ſtigma ſimple. *Pericarp*, legume ſcimeter-formed, turgid, outſide reticulated, otherwiſe pretty ſmooth; from ſix to ten inches long, and about two broad. *Seeds* generally from four to eight, ſmooth; grey, ſize of a large cheſnut."

The Jonefia flowers at the beginning of the hot ſeaſon, and its ſeeds ripen during the rains. The plants and ſeeds were originally brought to Calcutta from the interior parts of the country, where it is indigenous. *N. B.* Many of the flowers have only the rudiment of a piſtil. In Plate XXX. A is a branchlet of the natural ſize. B, A ſingle flower a little magnified; *a a* the calyx. C, A ſection of the ſame, exhibiting four of the ſtamens, 1 1 1 1 the piſtil 2, and how far the tube is perforated. D, A ſimilar ſection of one of the abortive flowers; 3 is the abortive piſtil. E, The ripe legume opening near the baſe, natural ſize. *Note*, The ſpace between the *b* and *c* marks the original tube of the corol. F, One of the ſeeds, natural ſize. G, The baſe of the common petiole, with its ſtipule; *a a*, the petioles of the lower pair of leaflets.

JOOTSI-Sima, a ſmall flat iſland, which is ſeparated from Cape Nota in Japan by a channel about five leagues wide. Its circumference does not exceed two leagues; it is well wooded, of an agreeable aſpect, and well inhabited. Perouſe, who ſailed round it, remarked from the quarter deck of his ſhip ſome conſiderable edifices between the houſes of the inhabitants; and hard by a ſort of caſtle, at the ſouth-weſt point of the iſland, he diſtinguiſhed ſome gibbets. He does not, however, affirm that thoſe gibbets were for the execution of criminals; for, as he obſerves, it would be ſingular enough if the Japaneſe, whoſe cuſtoms are ſo different from ours, were in this point to reſemble us ſo nearly. He repreſents the iſland as ſurrounded with dreadful breakers; at the diſtance of a league and a half from which, he had conſtantly 60 fathoms, with rocky bottom. He places the iſland (differently, according to the editor of his voyage, from all other geographers) in latitude 37° 51′ north, and in Long. 135° 20′ eaſt from Paris.

JOPPA, a ſmall town in Harford county, Maryland, 20 miles E. by N. of Baltimore, and 82 S. W. of Philadelphia.—*Morſe.*

JORDAN's *River* paſſes through Trenton, in the Diſtrict of Maine, 8 miles from Union river.—*ib.*

JORE, a village and mountain in the Cherokee country. The mountain is ſaid to be the higheſt in the Cherokee country, and through which the Tenneſſee river forces its waters. The Indian village, called Jore, is ſituated in a beautiful lawn, many thouſand feet higher than the adjacent country. Here is a little grove of the Caſine Yapon, called by the Indians the beloved tree. They are very careful to keep this tree pruned and cultivated, and drink very ſtrong infuſion of the leaves, buds, and tender branches of this plant. It is venerated by the Creeks, and all the ſouthern maritime nations of Indians.—*ib.*

JOSEPH, LAKE St, in N. America, lies E. of Lake Sal, and ſends its waters by Cat Lake river into Cat Lake, and afterwards forms the S. E. branch of Severn river. The lake is 35 miles long and 15 broad. Oſnaburg Houſe is on the N. E. part of the lake.—*ib.*

Joseph, *Ilet à Pierre*, a village on the weſternmoſt coaſt of the iſland of St Domingo; about 3 leagues N. W. of the village of Tiburon.—*ib.*

Joseph's, St, in the province of California, in Mexico, N. America. N. lat. 23° 3′.—*ib.*

Joseph's Bay, St, on the coaſt of Weſt-Florida, is of the figure of a horſe-ſhoe, being about 12 miles in length, and 7 acroſs where broadeſt. The bar is narrow, and immediately within it there is from 4 to 6½ fathoms ſoft ground. The beſt place to anchor, is juſt within the peninſula, oppoſite to ſome ruins that ſtill remain of the village of St Joſeph. The peninſula between St Joſeph's and Cape Blaze is a narrow ſlip of land, in ſome places not above a quarter of a mile broad. A very good eſtabliſhment might be made here for a fiſhery, as the ſettlers might make ſalt on the ſpot to cure the baſs, rock, cod, grouper, red mullet, &c. which are here in abundance.—*ib.*

Joseph, St, a water which runs N. W. into the S. E. part of Lake Michigan. It ſprings from a number of ſmall lakes, a little to the N. W. of the Miami village. The Pawtewatamie Indians reſide on this river, oppoſite Fort St Joſeph. They can raiſe 200 warriors. At or near the confluence of the rivers St Mary's and St Joſeph's where Fort Wayne now ſtands, the Indians have ceded to the United States a tract of 6 miles ſquare.—*ib.*

Joseph, *Fort St*, is ſituated on the eaſtern ſide of the above river in N. lat. 42° 14′, W. long. 86° 10′. It is about 175 miles S. W. by W. of Detroit, to which place there is a ſtraight road.—*ib.*

Joseph, St, a port on the W. ſide of the iſland of Trinidad, near the coaſt of Terra Firma.—*ib.*

JOURNALS, the title of periodical publications. See *Encyclopædia.* The principal Britiſh Journals are: *The Hiſtory of the Works of the Learned*, begun at London in 1699. *Cenſura Temporum*, in 1708. About the ſame time there appeared two new ones; the one under the title of *Memoirs of Literature*, containing little more than an Engliſh tranſlation of ſome articles in the foreign Journals, by M. de la Roche; the other, a collection of looſe tracts, intitled, *Bibliotheca Curioſa*, or a Miſcellany. Theſe, however, with ſome others, are now no more, but are ſucceeded by the *Annual Regiſter*, which began in 1758; the *New Annual Regi-*

ſter, begun in 1780; the *Monthly Review*, which began in the year 1749, and gives a character of all Engliſh literary publications, with the moſt conſiderable of the foreign ones: the *Critical Review*, which began in 1756, and is nearly on the ſame plan: as alſo the *London Review*, by Dr Kenrick, from 1775 to 1780; *Maty's Review*, from Feb. 1782 to Aug. 1786; the *Engliſh Review*, begun in Jan. 1783; and the *Analytical Review*, begun in May 1788, dropt in 1798, and revived in 1799, under the title of the *New Analytical Review*; but again dropt after two or three months trial: the *Britiſh Critic*, begun in 1792, and ſtill carried on with much ſpirit and ability: the *Anti-Jacobin Review and Magazine*, commenced in 1798, for the meritorious purpoſe of counteracting the pernicious tendency of French Principles in politics and religion: the *New London Review*, January 1799: *A Journal of Natural Philoſophy, Chemiſtry, and the Arts*, which was begun in 1797 by Mr Nicholſon, and has been conducted in ſuch a manner, that it is one of the moſt valuable works of the kind to be found in any language: the *Philoſophical Magazine*, begun in 1798 by Mr Tilloch, and carried on upon much the ſame plan, and with much the ſame ſpirit, as Nicholſon's Journal.

Beſides theſe, we have ſeveral monthly pamphlets, called *Magazines*, which, together with a chronological ſeries of occurrences, contain letters from correſpondents, communicating extraordinary diſcoveries in nature and art, with controverſial pieces on all ſubjects. Of theſe, the principal are thoſe called the *Gentleman's Magazine*, which began with the year 1731; the *London Magazine*, which began a few months after, and has lately been diſcontinued; the *Univerſal Magazine*, which is nearly of as old a date; the *Scotch Magazine*, which began in 1739, and is ſtill continued; the *European Magazine*; and the *Monthly Magazine*, a miſcellany of much information, which began in January 1796.

IOWA, a river of Louiſianna, which runs ſouth-eaſtward into the Miſſiſſippi, in N. lat. 41° 5′, 61 miles above the *Iowa Rapids*, where on the E. ſide of the river is the *Lower Iowa Town*, which 20 years ago could furniſh 300 warriors. The *Upper Iowa Town* is about 15 miles below the mouth of the river, alſo on the E. ſide of the Miſſiſſippi, and could formerly furniſh 400 warriors.—*Morse.*

JOYST or Jeyst, the ſecond month of the Bengal year.

IPSWICH, the *Agawam* of the Indians, is a poſt-town and port of entry on both ſides of Ipſwich river, in Eſſex county, Maſſachuſetts, 12 miles ſouth of Newburyport, 10 north-eaſt of Beverly, 32 N. E. by N. of Boſton, and about a mile from the ſea. The townſhip of Ipſwich is divided into 5 pariſhes, and contains 601 houſes, and 4502 inhabitants. There is an excellent ſtone bridge acroſs Ipſwich river, compoſed of two arches, with one ſolid pier in the bed of the river, which connects the two parts of the town, executed under the direction of the late Hon. Judge Choate. This was heretofore a place of much more conſideration than at preſent. Its decline is attributed to a barred harbour and ſhoals in the river. Its natural ſituation is pleaſant, and on all accounts excellently well calculated to be a large manufacturing town. The ſupreme judicial court, the courts of common pleas and ſeſſions are held here once a year, on the 1ſt Tueſday of April; and from its central ſituation, it appears to be the moſt convenient place for all the courts and public offices of the county. The inhabitants are chiefly farmers, except thoſe in the compact part of the townſhip. A few veſſels are employed in the fiſhery and a few trade to the Weſt Indies. Silk and thread lace, of an elegant texture, are manufactured here by women and children, in large quantities, and ſold for uſe and exportation in Boſton, and other mercantile towns. In 1790, no leſs than 41,979 yards were made here, and the manufacture is rather increaſing. Ipſwich townſhip was incorporated in 1634, and is 378 miles N. E. of Philadelphia. N. lat. 42° 43′, W. long. 70° 50′.—*Morse.*

Ipswich, New, a townſhip in Hillſborough county, New-Hampſhire, containing 1241 inhabitants, ſituated on the weſt ſide of Souheagan river, and ſeparated from Whatohook Mountain by the north line of Maſſachuſetts; 56 miles N. W. of Boſton, and about 77 weſt of Portſmouth. It was incorporated in 1762, and has in it a flouriſhing academy.—*ib.*

IRASBURG, a townſhip in Orleans county, in Vermont, ſituated on Black river, 17 miles N. of Hazen Block-houſe, and 12 S. of the Canada line. —*ib.*

IREDELL COUNTY, in Saliſbury diſtrict, N. Carolina, is ſurrounded by Surry, Rowan, and Burke. The climate is agreeable and healthy; the lands beautifully variegated with hills, and the ſoil is rich. It contains 5435 inhabitants of whom 858 are ſlaves. At *Iredell* court-houſe is a poſt-office. It is 25 miles from Saliſbury, and 25 from Charlotte court-houſe. —*ib.*

IRELAND, NEW, a long narrow iſland in the Pacific ocean, N. of New Britain, extending from the N. W. to the S. E. about 270 miles, and in general very narrow; between 3° and 5° S. lat. and 146° 30′, and 151° E. long. from Paris. The inhabitants are negroes. The iſland is covered with wood, and abounds with pigeons, parrots, and other birds. Weſt and N. W. of New Ireland, lie Sandwich, Portland, New Hanover, and Admiralty Iſlands, diſcovered and named by Captain Carteret, in 1767. The tracks of Le Maire and Schouten in 1616, of Roggewin in 1722, and of Bouganville in 1768, paſs theſe iſlands. —*ib.*

IROIS, POINTE DE, or *Iriſh Point*, a village on the W. end of the iſland of St Domingo.—*ib.*

IRON, is by much the moſt uſeful of all the metals, as has been ſufficiently proved under the article Iron, *Encycl.* and under Chemistry in this *Supplement*. The word is again introduced here, becauſe it affords us an opportunity of laying before our readers ſome valuable obſervations by Chaptal on the uſe of the *oxyds* of iron in dyeing cotton.

"The oxyd of iron has ſuch an affinity for cotton thread, that if the latter be plunged in a ſaturated ſolution of iron in any acid whatever, it immediately aſſumes a chamoy yellow colour, more or leſs dark, according to the ſtrength of the liquors. It is both a curious and eaſy experiment, that when cotton is made to paſs through a ſolution of the ſulphat of iron, rendered turbid by the oxyd which remains ſuſpended in the liquor, it will be ſufficient to dip the cotton in the bath to catch the laſt particle of the oxyd, and to reſtore to the liquor the tranſparency it has loſt. The ſolution, then, which before had a yellowiſh appearance, becomes more or leſs green, according as it is more or leſs charged.

“ The colour given to cotton by the oxyd of iron becomes darker, merely by expoſure to the air; and this colour, ſoft and agreeable when taken from the bath, becomes harſh and ochry by the progreſſive oxydation of the metal. The colour of the oxyd of iron is very faſt: it reſiſts not only the air and water, but alſo alkaline leys, and ſoap gives it ſplendour without ſenſibly diminiſhing its intenſity. It is on account of theſe properties that the oxyd of iron has been introduced into the art of dyeing, and been made a colouring principle of the utmoſt value.

“ In order that the oxyd of iron may be conveniently applied to the cotton thread, it is neceſſary to begin by effecting its ſolution; and, in this caſe, acids are employed as the moſt uſeful ſolvents. Dyers almoſt everywhere make a myſtery of the acid which they employ; but it is always the acetous, the ſulphuric, the nitric, or the muriatic. Some of them aſcribe great differences to the ſolution of iron by the one or the other acid; but, in general, they give the preference to the acetous. This predilection appears to be founded much leſs on the difference of the colours that may be communicated by the one or the other ſalt, than on the different degrees of corroſive power which each exerciſes on the ſtuff. That of the ſulphat and muriat is ſo great, that if the ſtuff be not waſhed when it comes from the bath, it will certainly be burnt; whereas ſolutions by the acetous, or any other vegetable acid, are not attended with the like inconvenience.

“ Iron appears to be at the ſame degree of oxydation in the different acids, ſince it produces the ſame ſhade of colour when precipitated; and any acid ſolvent may be employed indiſcriminately, provided the nature of the ſalt, and the degree of the ſaturation of the acid, be ſufficiently known; for the ſubſequent operations may be then directed according to this knowledge, and the inconveniences which attend the uſe of ſome of theſe ſalts may be prevented. This, without doubt, is a great advantage which the man of ſcience enjoys over the mere workman, who is incapable of varying his proceſs according to the nature and ſtate of the ſalts which he employs.

“ 1. If the ſulphat of iron, or any other martial ſalt, be diſſolved in water, and cotton be dipped in the liquid, the cotton will aſſume a chamoy colour, more or leſs dark according as the ſolution is more or leſs charged. The affinity of the cotton to the iron is ſo great, that it attracts the metal, and takes it in a great meaſure from the acid by which it was diſſolved.

“ 2. If the iron of a pretty ſtrong ſolution be precipitated by an alkaline liquor that ſhews five or ſix degrees (by the areometer of Baumé), the reſult will be a greeniſh blue magma. The cotton macerated in this precipitate aſſumes at firſt an unequal tint of dirty green; but mere expoſure to the air makes it in a little time turn yellow, and the ſhade is very dark.

“ It is by ſuch, or almoſt ſimilar proceſſes, that dyers communicate what is called among workmen an *ochre* or *ruſt colour*. But theſe colours are attended with ſeveral inconveniences to the artiſt: 1. Strong ſhades burn or injure the cloth: 2. This colour is harſh, diſagreeable to the eye, and cannot be eaſily united with the mild colours furniſhed by vegetables.”

To avoid theſe inconveniences, our author made ſeveral attempts, which led him to the following practice: He treads the cotton cold in a ſolution of the ſulphat of iron, marking three degrees: he wrings it carefully, and immediately plunges it in a ley of potaſh at two degrees, upon which he has previouſly poured to ſaturation a ſolution of the ſulphat of alumine: the colour is then brightened, and becomes infinitely more delicate, ſoft, and agreeable. The ſulphat no longer attacks the tiſſue of the ſtuff; and after the cotton has been left in the bath for four or five hours, it is taken out to be wrung, waſhen, and dried. In this manner we may obtain every ſhade that can be wiſhed, by graduating the ſtrength of the ſolutions. This ſimple proceſs, the theory of which preſents itſelf to the mind of every chemiſt, has the advantage of furniſhing a colour very agreeable, exceedingly fixed, and, above all, extremely economical. He employs it with great advantage in dyeing nankeens, as it has the property of reſiſting leys. It becomes brown, however, by the action of aſtringents.

M. Chaptal made ſeveral attempts to combine this yellow with the blue of indigo, in order to obtain a durable green; but as they were all unſucceſsful, he infers that there is not a ſufficient affinity between the blue of indigo and the oxyds of iron. He found that theſe oxyds, on the other hand, combine very eaſily with the red of madder, and produce a bright violet or plum colour, the uſe of which is as extenſive as beneficial in the cotton manufactory. But if we ſhould confine ourſelves to apply theſe two colours to cotton, without having employed a mordant capable of fixing the latter, the colour would not only remain dull and diſagreeable by the impoſſibility of brightening it, but it would ſtill be attended with the great inconvenience of not reſiſting leys. We muſt begin, then, by preparing the cotton as if to diſpoſe it for receiving the Adrianople red; and when it has been brought to the operation of galling, it is to be paſſed through a ſolution of iron, more or leſs charged, according to the nature of the violet required: it is then to be carefully waſhed, twice maddered, and brightened in a bath of ſoap.

When a real velvety rich violet is required, it is not to be paſſed through the ſolution of iron till it has been previouſly galled; the iron is then precipitated in a bluiſh oxyd, which, combined with the red of madder, gives a moſt brilliant purple, more or leſs dark according to the ſtrength of the galling and of the ferruginous ſolution. It is very difficult to obtain an equal colour by this proceſs; and in manufactories, an equal violet is conſidered as a maſter-piece of art. It is generally believed, that it is only by well-directed manipulations that it is poſſible to reſolve this problem, of ſo much importance in dyeing. But I am convinced (ſays our author), that the great cauſe of the inequality in this dye is, that the iron depoſited on the cotton receives an oxydation merely by expoſure to the air, which varies in different parts of it. The threads which are on the outſide of the hank are ſtrongly oxydated, while thoſe in the inſide, removed from the action of the air, experience no change. It thence follows, that the inſide of the hank preſents a weak ſhade, while the exterior part exhibits a violet almoſt black. The means

Iron.

Iron banks, ‖ Iſabel.

to remedy this inconvenience is, to waſh the cotton when it is taken from the ſolution of iron, and to expoſe it to the madder moiſt. The colour will become more equal and velvety. The ſolvents of iron are almoſt the ſame for this colour as for the yellow colour already mentioned.

The following obſervation may ſerve to guide the artiſt in brightening the violet on his cotton. The red of madder and the oxyd of iron depoſited on the ſtuff determine the violet colour. This colour becomes red or blue, according as either of the principles predominates. The dyer knows by experience how difficult it is to obtain a combination which produces the tone of colour deſired, eſpecially when it is required to be very full, lively, and durable. This object, however, may be obtained, not only by varying the proportions of the two colouring principles, but alſo by varying the proceſs of brightening. The only point is to be acquainted with the two following facts; that the ſoda deſtroys the iron, while the ſoap, by ſtrong ebullition, ſeizes in preference the red of the madder. Hence it is, that the colour may be inclined to red or blue, according as you brighten with one or the other of theſe mordants. Thus, cotton taken from the madder dye, when waſhed and boiled in the brightening liquor with $\frac{1}{10}$ths of ſoap, will give a ſuperb violet; whereas you will obtain only a plum colour in treating it with ſoda.

The oxyd of iron precipitated on any ſtuff unites alſo very advantageouſly with the fawn colour furniſhed by aſtringents; and by varying the ſtrength of mordants, an infinity of ſhades may be produced. In this caſe, it is leſs a combination or ſolution of principles than the ſimple mixture or juxta-poſition of the colouring bodies on the ſtuff. By means of a boiling heat, we may combine, in a more intimate manner, the oxyd of iron with the aſtringent principle: and then it is brought to the ſtate of black oxyd, as has been obſerved by Berthollet. It is poſſible alſo to embrown theſe colours, and to give them a variety of tints, from the bright grey to the deep black, by merely paſſing the cottons impregnated with the aſtringent principle thro' a ſolution of iron. The oxyd is then precipitated itſelf by the principle which is fixed on the ſtuff.

An obſervation, which may become of the utmoſt value for the art of dyeing, is, that the moſt uſual aſtringent vegetables all furniſh a yellow colour, which has not much brilliancy, but which has ſufficient fixity to be employed with advantage. This yellow colour is brightened in the ſeries of vegetables, in proportion as the aſtringent principle is diminiſhed, and the vivacity of the colour is augmented in the ſame proportion. It is difficult, then, to obtain yellow colours which are at the ſame time durable and brilliant. Theſe two valuable qualities are to each other in an inverſe ratio; but it is poſſible to unite the colouring principles in ſuch a manner as to combine ſplendour with fixity. Green oak bark unites perfectly with yellow weed, and ſumach with green citron. It is by this mixture that we may be able to combine with the oxyd of iron vegetable colours, the ſplendour of which is equal to their durability.

Our author concludes his obſervations with cautioning the dyer againſt ſubſtituting ſumach and the bark of the alder tree or oak for gall when dyeing cotton red. "I can ſafely aſſert (ſays he), that it is impoſſible to employ theſe as ſubſtitutes, in whatever doſes they may be uſed. The colour is always much paler, poorer, and leſs fixed. I know that the caſe is not the ſame in regard to dyeing wool and ſilk, in which it may be employed with ſucceſs; and in giving an account of this difference, I think the cauſe of it may be found in the nature of the gall-nuts. 1. The acid which they excluſively contain, as Berthollet has proved, facilitates the decompoſition of the ſoap with which the cottons have been impregnated, and the oil then remains fixed in their tiſſue, and in a greater quantity, as well as in a more intimate combination. 2. The gall-nuts, which owe their development to animal bodies, retain a character of animaliſation, which they tranſmit to the vegetable ſtuff, and by theſe means augment its affinities with the colouring principle of the madder; for it is well known of what utility animal ſubſtances are to facilitate this combination. This animaliſation becomes uſeleſs in operating upon woollen or ſilk."

IRON BANKS, a tract of land on the E. ſide of the Miſſiſſippi, below the mouth of the Ohio.—*Morse.*

Iron-Castle, one of the forts of Porto Bello, in S. America, which admiral Vernon took and deſtroyed in 1739. The Spaniards call it St Philip de todo Fierra.—*ib.*

IRONDEQUAT, called in ſome maps *Ge Rundegut*, a gulf or bay on the S. ſide of the Lake Ontario, 4 miles E. of Walker's at the mouth of Geneſſee river.—*ib.*

IRON MOUNTAINS, Great, in the State of Tenneſſee, extend from the river Tenneſſee to that of French Broad from S. W. to N. E. farther to the N. E. the range has the name of Bald Mountain, and beyond the Nolachucky, that of Iron Mountains. The Iron Mountains, ſeems to be the name generally applied to the whole range. It conſtitutes the boundary between the State of Tenneſſee, and that of North-Carolina, and extends from near the lead mines, on the Kanhaway, through the Cherokee country, to the ſouth of Chota, and terminates near the ſources of the Mobile. The caverns and caſcades in theſe mountains are innumerable.—*ib.*

IRRATIONAL Numbers or *Quantities*, are the ſame as *ſurds*, for which ſee Algebra, *Encycl.*

IRREDUCIBLE Case, in algebra, is uſed for that caſe of cubic equations where the root, according to Cardan's rule, appears under an impoſſible or imaginary form, and yet is real.

It is remarkable that this caſe always happens, *viz.* one root, by Cardan's rule, in an impoſſible form, whenever the equation has three real roots, and no impoſſible ones, but at no time elſe.

If we were poſſeſſed of a general rule for accurately extracting the cube root of a binomial radical quantity, it is evident we might reſolve the irreducible caſe generally, which conſiſts of two of ſuch cubic binomial roots. But the labours of the algebraiſts, from Cardan down to the preſent time, have not been able to remove this difficulty. Dr Wallis thought that he had diſcovered ſuch a rule; but, like moſt others, it is merely tentative, and can only ſucceed in certain particular circumſtances.

IRVIN *River* is a weſtern head water of the Neus, in N. Carolina.—*Morse.*

ISABEL, St, one of the iſlands of Solomon, 200
miles

miles in circumference in the Pacific Ocean, 7° 30′ S. lat. about 160 leagues W. of Lima, diſcovered by Mendana, 1567, whoſe inhabitants are cannibals, and worſhip ſerpents, toads, and other animals. Their complexion is bronze, their hair woolly, and they wear no covering but round the waiſt. The people are divided into tribes, and are conſtantly at war with each other. Bats were ſeen here, which from one extremity of their wings to the other, meaſured 5 feet. Dampier, who has the reputation of exactneſs, ſays that he ſaw, in the ſmall iſland of Sabuda, on the W. coaſt of Papua, bats as large as young rabbits, having wings 4 feet in extent from one tip to the other.—*ib.*

ISABELLA *Point*, lies on the N. ſide of the iſland of St Domingo, and forms the N. E. ſide of the bay of its name. N. lat. 19° 59′ 10″. This is the port where Columbus formed the firſt Spaniſh ſettlement on the iſland, and named both it and the point after his patroneſs Queen Iſabella. He entered it in the night, driven by a tempeſt. It is over-looked by a very high mountain flat at the top, and ſurrounded with rocks, but is a little expoſed to the N. W. wind. The river Iſabella which falls into it, is conſiderable. There are 14 fathoms of water to anchor in. The ſettlement was begun in 1493, was given up in 1496, when its inhabitants were carried to the city of St Domingo, which originally was called New Iſabella. The bay is ſaid to have good anchorage for ſhips of war. It is about 29 leagues eaſt by north of Cape Francois, meaſuring in a ſtraight line.—*ib.*

ISCA, or rather *Ica*, with Piſco and Naſca, three towns from which a juriſdiction of Lima in Peru, S. America, has its name. Great quantities of wine are made here and exported to Calao. It alſo produces excellent olives, either for eating or for oil. The fields which are watered by trenches, yield an uncommon plenty of wheat, maize, and fruits. This juriſdiction is remarkable for ſpacious woods of carob trees, with the fruit of which the inhabitants feed numbers of aſſes, for the uſes of agriculture, to this and the neighbouring juriſdictions. The Indians who live near the ſea apply themſelves to fiſhing, and after ſalting the fiſh carry them to a good market in the towns among the mountains.—*ib.*

ISLE OF WIGHT, a county of Virginia, on the ſouth ſide of James's river, weſt of Norfolk county, being about 40 miles long and 15 broad, and contains 9,028 inhabitants, including 3,867 ſlaves. A mineral ſpring has been diſcovered near the head of the weſt branch of Nanſemond river, about 10 miles from Smithfield, and 12 from Suffolk. It is much reſorted to, and famed for its medicinal qualities.—*ib.*

ISLE ROYAL, on the north-weſt ſide of Lake Superior, lies within the territory of the United States north-weſt of the Ohio, is about 100 miles long, and in many places about 40 broad. The natives ſuppoſe that this and the other iſlands in the lake are the reſidence of the Great Spirit.—*ib.*

ISLESBOROUGH, a townſhip in Hancock county, Maine, formed by Long-Iſland, in the centre of Penobſcot Bay, 15 miles in length, and from 2 to 3 in breadth. It was incorporated in 1789, contains 382 inhabitants, and is 260 miles N. E. by N. of Boſton. —*ib.*

ISLES DE MADAME lie at the ſouth end of Sydney, or Cape Breton Iſland, on which they are dependant. The largeſt of theſe, with Cape Canſo, the eaſt point of Nova-Scotia, form the entrance of the Gut of Canſo from the Atlantic ocean.—*ib.*

ISLIP, a townſhip of New-York, ſituated in Suffolk county, Long-Iſland, eaſt of Huntington, and contains 639 inhabitants; of theſe 93 are electors, and 35 ſlaves.—*ib.*

JUAN DE FUCA, a celebrated ſtrait on the north-weſt coaſt of America, was ſurveyed by Captain Vancouver in the Diſcovery ſloop of war, with a view to aſcertain whether it leads to any communication between the North Pacific and the North Atlantic Oceans. As they advanced within the opening of the ſtrait, their progreſs was greatly retarded by the number of inlets into which the entrance branched in every direction; and moſt of theſe were examined by the boats, which were frequently abſent from the ſhips on this ſervice for ſeveral days together. In the midſt of their labours, they were ſurpriſed by the ſight of two Spaniſh veſſels of war, employed, like themſelves, in ſurveying this inlet, the examination of which had been begun by them in the preceding year. Meaſures of mutual aſſiſtance were concerted between the captains of the two nations for the proſecution of the ſurvey, in which each agreed to communicate to the other their diſcoveries. Not one of the many arms of the inlet, nor of the channels which they explored in this broken part of the coaſt, was found to extend more than 100 miles to the eaſtward of the entrance into the ſtrait. After having ſurveyed the ſouthern coaſt, on which ſide a termination was diſcovered to every opening, by following the continued line of the ſhore, they were led to the northward, and afterward towards the north-weſt, till they came into the open ſea through a different channel from the ſtrait of Juan de Fuca, by which they had commenced this inland navigation.

Thus it appeared, that the land forming the north ſide of that ſtrait is part of an iſland, or of an archipelago, extending nearly 100 leagues in length from S. E. to N. W.; and on the ſide of this land moſt diſtant from the continent is ſituated Nootka Sound. The moſt peculiar circumſtance of this navigation is the extreme depth of water, when contraſted with the narrowneſs of the channels. The veſſels were ſometimes drifted about by the currents during the whole of a night, cloſe to the rocks, without knowing how to help themſelves, on account of the darkneſs, and the depth being much too great to afford them anchorage.

In the courſe of this ſurvey, the voyagers had frequent communications with the natives, whom they met ſometimes in canoes and ſometimes at their villages. In their tranſactions with Europeans, they are deſcribed as "well verſed in the principles of trade, which they carried on in a very fair and honourable manner." In other reſpects they were leſs honeſt. At one village 200 ſea otter ſkins were purchaſed of them by the crews of the veſſels in the courſe of a day; and they had many more to ſell in the ſame place, as alſo ſkins of bears, deer, and other animals. One party of Indians whom they met had the ſkin of a young lioneſs; and theſe ſpoke a language different from that uſed in Nootka Sound. Veniſon was ſometimes brought for ſale; and a piece of copper, not more than a foot ſquare, purchaſed one whole deer and part of another. Among other articles of traffic, two children, ſix or ſeven years of age, were offered for ſale. The commodities moſt prized by the natives were fire-arms, copper, and great coats. Beads and trinkets they would only receive as preſents, and not as articles of exchange. Many of them were poſſeſſed of fire-arms. In one part it is related, that after a chief had received ſome preſents, "he, with moſt of his companions, returned to the ſhore; and, on landing, fired ſeveral muſkets, to ſhew, in all probability, with what dexterity they could uſe theſe weapons, to which they ſeemed as familiarized as if they had been accuſtomed to fire-arms from their earlieſt infancy."

The dreſſes of theſe people, beſides ſkins, are a kind of woollen garments; the materials compoſing which are explained in the following extract:

"The dogs belonging to this tribe of Indians were numerous, and much reſembled thoſe of Pomerania, though, in general, ſomewhat larger. They were all ſhorn as cloſe to the ſkin as ſheep are in England; and ſo compact were their fleeces, that large portions could be lifted up by a corner without cauſing any ſeparation. They were compoſed of a mixture of a coarſe kind of wool, with very fine long hair, capable of being ſpun into yarn. This gave Captain Vancouver reaſon to believe, that their woollen cloathing might in part be compoſed of this material mixed with a finer kind of wool from ſome other animal, as their garments were all too fine to be manufactured from the coarſe coating of the dog alone."

Of other animals alive, deer only were ſeen in any abundance by our people.

The number of inhabitants computed to be in the largeſt of the villages or towns that were diſcovered, did not exceed 600. Captain Vancouver conjectured the ſmall-pox to be a diſeaſe common and very fatal among them. Many were much marked; and moſt of theſe had loſt their right eye. Their method of diſpoſing of their dead is very ſingular.

"Baſkets were found ſuſpended on high trees, each containing the ſkeleton of a young child; in ſome of which were alſo ſmall ſquare boxes filled with a kind of white paſte, reſembling (ſays our author) ſuch as I had ſeen the natives eat, ſuppoſed to be made of the faranne root; ſome of theſe boxes were quite full, others were nearly empty, eaten probably by the mice, ſquirrels, or birds. On the next low point ſouth of our encampment, where the gunners were airing the powder, they met with ſeveral holes in which human bodies were interred, ſlightly covered over, and in different ſtates of decay, ſome appearing to have been very recently depoſited. About half a mile to the northward of our tents, where the land is nearly level with high water mark, a few paces within the ſkirting of the wood, a canoe was found ſuſpended between two trees, in which were three human ſkeletons.

"On each point of the harbour, which, in honour of a particular friend, I called *Penn's Cove*, was a deſerted village; in one of which were found ſeveral ſepulchres, formed exactly like a centry box. Some of them were open, and contained the ſkeletons of many young children tied up in baſkets: the ſmaller bones of adults were likewiſe noticed, but not one of the limb bones could here be found; which gave riſe to an opinion, that theſe, by the living inhabitants of the neighbourhood, were appropriated to uſeful purpoſes; ſuch as pointing their arrows, ſpears or other weapons."

However honourably theſe people have been repreſented in their conduct as traders, it appeared on ſeveral occaſions that it was unſafe to depend on their good-will alone: and ſome inſtances occurred, of their making every preparation for an attack, from which they deſiſted only on being doubtful of the event; yet immediately on relinquiſhing their purpoſe, they would come with the greateſt confidence to trade, appearing perfectly regardleſs of what had before been in agitation. The boats, as already noticed, were frequently at a great diſtance from the ſhips; and on ſuch occaſions, when large parties of Indians have firſt ſeen them, they generally held long conferences among themſelves before they approached the boats; probably for the purpoſe of determining the mode of conduct which they judged it moſt prudent to obſerve. Captain Vancouver places the entrance of the ſtrait of Juan de Fuca in 48° 20′ N. Lat. and 124° W. Long.

JUAN, St, the capital of California in N. America. N. lat. 26° 25′, W. long. 114° 9′.—*Morſe.*

Juan, *Fort St*, ſtands in the province of New Leon, in N. America, on the S. W. ſide of the Rio Bravo, in the 29th degree of N. latitude and 101ſt of W. longitude.—*ib.*

JUDITH, POINT, the ſouth-eaſternmoſt point of Rhode-Iſland State, ſituated on the ſea-coaſt of Waſhington county, in South-Kingſton townſhip.—*ib.*

JUDOSA BAY, in Louiſianna, lies in the N. W. corner of the gulf of Mexico. A chain of iſlands form a communication between it ſouth weſtward to St Bernard's Bay.—*ib.*

JUGGLERS are a kind of people whoſe profeſſion has not been often deemed either reſpectable or uſeful. Profeſſor Beckmann, however, has undertaken their defence; and in a long and learned chapter in the third volume of his *Hiſtory of Inventions*, pleads the cauſe of the practiſers of legerdemain; rope-dancers; perſons who place their bodies in poſitions apparently dangerous; and of thoſe who exhibit feats of uncommon ſtrength. All theſe men he claſſes under the general denomination of *Jugglers;* and taking it for granted (ſurely upon no good grounds) that every uſeful employment is full, he contends, that there would not be room on the earth for all its preſent inhabitants did not ſome of them practiſe the arts of *Juggling*.

"Theſe arts (ſays he) are indeed not unprofitable, for they afford a comfortable ſubſiſtence to thoſe who practiſe them; but their gain is acquired by too little labour to be hoarded up; and in general, theſe roving people ſpend on the ſpot the fruits of their ingenuity; which is an additional reaſon why their ſtay in a place ſhould be encouraged. But farther, it often happens, that what ignorant perſons firſt employ, merely as a ſhow, for amuſement or deception, is afterwards ennobled by being applied to a more important purpoſe. The machine with which a Savoyard, by means of ſhadows, amuſed children and the populace, was by Liberkühn converted into a ſolar microſcope; and, to give one example more, the art of making ice in ſummer, or in a heated oven, enables gueſts, much to the credit of their hoſteſs, to cool the moſt expenſive diſhes. The Indian diſcovers precious ſtones, and the European, by poliſhing, gives them a luſtre.

"But, if the arts of juggling ſerved no other end than to amuſe the moſt ignorant of our citizens, it is proper that they ſhould be encouraged for the ſake of thoſe who cannot enjoy the more expenſive deceptions of an opera. They anſwer other purpoſes, however, than that of merely amuſing : they convey inſtruction in the moſt acceptable manner, and ſerve as an agreeable antidote to ſuperſtition, and to that popular belief in miracles, exorciſm, conjuration, ſorcery, and witchcraft, from which our anceſtors ſuffered ſo ſeverely."

Surely this reaſoning, as well as the cauſe in which it is brought forward, is unworthy of the learning of Beckmann. It is indeed true, that jugglers ſpend their money freely, and that their arts afford them the means of ſubſiſtence ; but it is very ſeldom, as our author muſt know, that they ſubſiſt either comfortably or innocently. Is it innocent to entice the ignorant and labouring poor, by uſeleſs deceptions, to part with their hard-earned pittance to idle vagabonds ? or is the life of thoſe vagabonds comfortable, when it is paſſed amid ſcenes of the moſt grovelling diſſipation? Jugglers ſpend indeed their money, for the moſt part, on the ſpot where it is gained ; but they ſpend it in drunkenneſs, and other ſeducing vices, which corrupt their own morals and the morals of all with whom they aſſociate ; and therefore their ſtay in a place ſhould certainly *not* be encouraged. Could it be proved that the ſolar microſcope would never have been invented, had not a Savoyard juggler contrived a ſimilar machine to amuſe children and the rabble, ſome ſtreſs might be laid on the ſervice which ſuch wretches have rendered to ſcience : but where is the man that will ſuppoſe the philoſophy of Bacon and Newton to reſt upon the arts of juggling ? or who conſiders the refinements of ſcience as of equal value with the morals of the people ? There is, at the moment in which this article is drawing up, a fellow exhibiting, before the windows of the writer's chamber, the moſt indecent ſcenes by means of puppets, and keeping the mob in a conſtant roar. Is he innocently employed ? or will any good man ſay that there is not room for him in the armies which on the Continent are fighting in the cauſe of God and humanity ?

Our author endeavours to ſtrengthen his reaſoning by proving, which he does very completely, the antiquity of juggling. "The deception (ſays he) of breathing out flames, which at preſent excites, in a particular manner, the aſtoniſhment of the ignorant, is very ancient. When the ſlaves in Sicily, about a century and a half before our æra, made a formidable inſurrection, and avenged themſelves in a cruel manner for the ſeverities which they had ſuffered, there was amongſt them a Syrian named Eunus, a man of great craft and courage, who, having paſſed through many ſcenes of life, had become acquainted with a variety of arts. He pretended to have immediate communication with the gods ; was the oracle and leader of his fellow ſlaves ; and, as is uſual on ſuch occaſions, confirmed his divine miſſion by miracles. When, heated by enthuſiaſm, he was deſirous of inſpiring his followers with courage, he breathed flames or ſparks among them from his mouth while he was addreſſing them. We are told by hiſtorians, that for this purpoſe he pierced a nut-ſhell at both ends, and having filled it with ſome burning ſubſtance, put it into his mouth and breathed through it.

"This deception, at preſent, is performed much better. The juggler rolls together ſome flax or hemp, ſo as to form a ball about the ſize of a walnut ; ſets it on fire ; and ſuffers it to burn till it is nearly conſumed ; he then rolls round it, while burning, ſome more flax ; and by theſe means the fire may be retained in it for a long time. When he wiſhes to exhibit, he ſlips the ball unperceived into his mouth and breathes through it ; which again revives the fire, ſo that a number of weak ſparks proceed from it ; and the performer ſuſtains no hurt, provided he inſpire the air not through the mouth but the noſtrils.

"For deceptions with fire the ancients employed alſo naphtha, a liquid mineral oil, which kindles when it only approaches a flame. (See NAPHTHA, *Encycl.*) Galen informs us, that a perſon excited great aſtoniſhment by extinguiſhing a candle and again lighting it, without any other proceſs than holding it immediately againſt a wall or a ſtone. The whole ſecret of this conſiſted in having previouſly rubbed over the wall or ſtone with ſulphur. But as the author, a few lines before, ſpeaks of a mixture of ſulphur and naphtha, we have reaſon to think that he alludes to the ſame here. Plutarch relates how Alexander the Great was aſtoniſhed and delighted with the ſecret effects of naphtha, which were exhibited to him at Ecbatana. The ſame author, as well as Pliny, Galen, and others, has already remarked that the ſubſtance with which Medea deſtroyed Creuſa, the daughter of Creon, was nothing elſe than this fine oil. She ſent to the unfortunate princeſs a dreſs beſmeared with it, which burſt into flames as ſoon as ſhe approached the fire of the altar. The blood of Neſſus, in which the dreſs of Hercules, which took fire likewiſe, had been dipped, was undoubtedly naphtha alſo ; and this oil muſt have been always employed when offerings caught fire in an imperceptible manner.

"In modern times, perſons who could walk over burning coals or red-hot iron, or who could hold red-hot iron in their hands, have often excited wonder. But laying aſide the deception ſometimes practiſed on the ſpectators, the whole of this ſecret conſiſts in rendering the ſkin of the ſoles of the feet and hands ſo callous and inſenſible, that the nerves under them are ſecured from all hurt, in the ſame manner as by ſhoes and gloves. Such calloſity will be produced if the ſkin is continually compreſſed, ſinged, pricked, or injured in any other manner. Thus do the fingers of the induſtrious ſempſtreſs become horny by being frequently pricked ; and the caſe is the ſame with the hands of fire workers, and the feet of thoſe who walk bare footed over ſcorching ſand.

"In the month of September 1765, when I viſited (ſays our author) the copper-works at Aweſtad, one of the workmen, for a little drink money, took ſome of the melted copper in his hand, and after ſhewing it to us, threw it againſt a wall. He then ſqueezed the fingers of his horny hand cloſe to each other ; put it a few minutes under his arm-pit, to make it ſweat, as he ſaid ; and, taking it again out, drew it over a ladle filled with melted copper, ſome of which he ſkimmed off, and moved his hand backwards and forwards, very quickly, by way of oſtentation. While I was viewing this performance, I remarked a ſmell like that of ſinged horn or leather, though his hand was not burnt. It is highly probable, that people who hold in their hands red hot iron, or who walk upon it, as I ſaw done at Amſterdam, but

Jugglers.

at a diſtance, make their ſkin callous before, in the like manner. This may be accompliſhed by frequently moiſtening it with ſpirit of vitriol; according to ſome the juice of certain plants will produce the ſame effect; and we are aſſured by others, that the ſkin muſt be very frequently rubbed, for a long time, with oil, by which means, indeed, leather alſo will become horny*."

Our author then proves, in a very learned manner, that all theſe tricks were of high antiquity; that the Hirpi, who lived near Rome, jumped through burning coals; that women were accuſtomed to walk over burning coals at Caſtabala in Cappadocia, near the temple dedicated to Diana; that the exhibition of balls and cups (ſee Legerdemain, *Encycl.*) is often mentioned in the works of the ancients; that in the third century, one Firmus or Firmius, who endeavoured to make himſelf emperor in Egypt, ſuffered a ſmith to forge iron on an anvil placed on his breaſt; that rope-dancers with balancing poles are mentioned by Petronius and others; and that the various feats of horſemanſhip exhibited in our circuſes paſſed, in the thirteenth century, from Egypt to the Byzantine court, and thence over all Europe.

* *Haller, Elementa Phyſiolog.*

Julian, || Iwanee.

JULIAN, St, a harbour on the coaſt of Patagonia, in South America, where ſhips bound to the Pacific ocean uſually touch for refreſhment. S. lat. 48° 51′, W. long. 65° 10′.—*Morſe.*

JULIET, Mount, in North-America, lies on the north ſide of Illinois river, oppoſite the place where that river is formed by the junction of Theakiki and Plein rivers. The middle of Mount Juliet is in N. lat. 42° 5′, W. long. 88° 44′.—*ib.*

JUNGLE, in Bengal, waſte land, or land covered with wood and brambles.

JUNIUS, a military townſhip in New-York State, bounded north by Galen, and ſouth by Romulus.—*Morſe.*

Junius Creek, a northern branch of the Little Kanhaway, which interlocks with the weſtern waters of Monongahela river; and which may one day admit a ſhorter paſſage from the latter into the Ohio.—*ib.*

IWANEE, a little town near St Jago de Cuba, where a ſmall remnant of the ancient Indians live, who have adopted the manners and language of the Spaniards.—*ib.*

K.

Kaarta.

KAARTA, a kingdom in Africa, through which Mr Park paſſed in his route from the Gambia to the Niger. He deſcribes the country as conſiſting either of ſandy plains or rocky hills; but, from his account, the level part ſeems to be the moſt extenſive. The natives are negroes, of whom many, though converted to the Mahomedan faith, or rather to the ceremonial part of the Mahomedan religion, retain all their ancient ſuperſtitions, and even drink ſtrong liquors. They are called Johers or Jowers, and in Kaarta form a very numerous and powerful tribe. One of theſe men undertook to conduct our author to Kemmoo, the capital of the kingdom, and alarmed him not a little by his ſuperſtitious ceremonies.

We had no ſooner (ſays Mr Park) got into a dark and lonely part of the firſt wood, than he made a ſign for us to ſtop, and taking hold of a hollow piece of bamboo, that hung as an amulet round his neck, whiſtled very loud, three times. I confeſs I was ſomewhat ſtartled, thinking it was a ſignal for ſome of his companions to come and attack us; but he aſſured me that it was done merely with a view to aſcertain what ſucceſs we were likely to meet with on our preſent journey. He then diſmounted, laid his ſpear acroſs the road, and having ſaid a number of ſhort prayers, concluded with three loud whiſtles; after which he liſtened for ſome time, as if in expectation of an anſwer, and receiving none, told us we might proceed without fear, for there was no danger."

White men were ſtrangers in the kingdom of Kaarta; and the appearance of our author had on ſome of the natives the effect which ignorant people, in this country, attribute to ghoſts. "I had wandered (ſays he) a little from my people, and being uncertain whether they were before or behind me, I haſtened to a riſing ground to look about me. As I was proceeding towards this eminence, two negro horſemen, armed with muſkets, came galloping from among the buſhes: on ſeeing them I made a full ſtop; the horſemen did the ſame, and all three of us ſeemed equally ſurpriſed and confounded at this interview. As I approached them their fears increaſed, and one of them, after caſting upon me a look of horror, rode off at full ſpeed; the other, in a panic of fear, put his hand over his eyes, and continued muttering prayers until his horſe, ſeemingly without the rider's knowledge, conveyed him ſlowly after his companion. About a mile to the weſtward, they fell in with my attendants, to whom they related a frightful ſtory: it ſeems their fears had dreſſed me in the flowing robes of a tremendous ſpirit; and one of them affirmed, that when I made my appearance, a cold blaſt of wind came pouring down upon him from the ſky like ſo much cold water."

Kaarta, || Kaats.

At Kemmoo our traveller was graciouſly received by the king; who honeſtly told him, however, that he could not protect him, being then engaged in war with the king of Bambarra (See Sego in this *Supplement*); but he gave him a guard to Jarra, the frontier town of the neighbouring kingdom of Ludamar. The origin and iſſue of this war between Kaarta and Bambarra, of which Mr Park gives a full account, ſhews the folly of attempting to liberate the negroes from ſlavery till civilization and Chriſtianity be introduced into Africa. Major Rennel places Kemmoo, the capital of Kaarta, in 14° 15′ N. Lat. and 7° 20′ W. Lon.

KAATS' BAAN, in New-York State, lies on the weſt bank of Hudſon's river, 7 miles ſoutherly from Kaats' Kill, and 11 N. E. by N. from Eſopus.—*Morſe.*

Kaats' Kill, or *Catſkill*, a ſmall village of 30 or 40 houſes and ſtores, in the State of New-York, ſituated on the weſt ſide of Hudſon's river, about 100 rods from its bank; 5 miles ſouth of Hudſon city, and 125 north of New York. It has the appearance of a thriving place, and it is in contemplation to erect buildings on a marſhy point, on the margin of the river, for the advantage of deeper water. The creek on which the ſtores now ſtand being too ſhallow. The townſhip of this name contains 1,980 inhabitants, of whom 343 are electors, and 305 ſlaves.—*ib.*

Kaats' Kill *Mountains*, in the vicinity of the above town on the weſt bank of Hudſon's river, which make a majeſtic appearance. Theſe are the firſt part of the chain of mountains called the Allegany, or Appalachian mountains.—*ib.*

KABOBIQUAS, a nation in ſouth Africa, who had never ſeen a white man till 1785, that they were viſited by M. Vaillant. Intimation had been given of his approach by ſome of the tribes through whoſe country he had previouſly paſſed; and every thing that had been ſaid of his colour, his fuſees, and his equipage, bore the character of the moſt enthuſiaſtic exaggeration. The curioſity of the people was wound up to the higheſt pitch; and as ſoon as they ſaw his company at a diſtance, the whole horde quitted the kraal, and ran with eagerneſs to meet him. Not being able to believe their eyes in regard to what they ſaw, they endeavoured to obtain more ſatisfaction by touching him. They felt his hair, hands, and almoſt every part of his body. His beard, above all, aſtoniſhed them to an inconceivable degree. More than thirty perſons came in ſucceſſion, and half unbuttoned his clothes. They all imagined him to be a hairy animal; and ſuppoſed, without doubt, that his body was covered with hair as long as that on his chin; but finding this not to be the caſe, they were aſtoniſhed, and confeſſed, with the openneſs of ſavages, that they had never ſeen the like in any man of their country. The little children, terrified at his appearance, hid themſelves behind their mothers. When he attempted to lay hold of any of them, in order to careſs them, they ſent forth loud cries, as a child would do in Europe who ſhould ſee a negro for the firſt time.

The grown up people, however, were ſoon reconciled to his appearance, and even the children were bribed by ſmall bits of ſugar candy. The chief of the horde ſhowed him every mark of attachment. He was a man advanced in life, and of a majeſtic figure. He wore a long mantle, which hung from his ſhoulders to the ground, and which, formed of four jackal ſkins joined together, was bordered at the ſides with that of a hyæna. His left hand wanted two joints of the little finger, which he ſaid, were amputated in his infancy to cure him of a ſevere illneſs.

This cuſtom of ſavages, who, to relieve a man from pain, add new ſufferings to his evils, affords a vaſt field for reflection. Mr Paterſon, another African traveller, tells us, that he obſerved inſtances of the ſame practice among a horde at the mouth of Orange-river; which is not improbable. However abſurd a cuſtom may be, ſavage tribes, when they are neighbours, may borrow it from each other; but that it ſhould be common among the iſlanders of the South Sea, who, ſince their country was firſt inhabited, had never ſeen ſtrangers before Cook and Bougainville, is truly aſtoniſhing. Our author was very deſirous of interrogating minutely the people of the horde on this ſubject. He wiſhed alſo to propoſe ſome queſtions to them reſpecting other cuſtoms which appeared ſingular; but difficulties increaſed the more he advanced into the country. The Kabobiquas ſpoke a particular language; and this dialect, though accompanied with the clapping noiſe of the Hottentots, was underſtood only by the Koraquas, who, on account of their vicinity, kept up ſome intercourſe with them. The caſe was the ſame with the language of the Koraquas, in regard to their neighbours the Nimiquas; and nothing reached our author's ear till it had paſſed through four different mouths. The conſequence was, that when he aſked any thing, the anſwer had frequently no relation to the queſtion; and for this inconveniency no remedy could be found.

The ſame deſire for trinkets to ornament their dreſs prevailed among the Kabobiquas as among the other hordes which Vaillant had viſited; and in one day he purchaſed twenty oxen for things of that kind of no value. The chief, however, had ſet his affections on a razor; and juſt when our author and he were treating about it, a ſhot was fired near them, which was inſtantly followed by the moſt frightful cries. "Ruſhing inſtantly from my tent (ſays M. Vaillant) to enquire what was the cauſe of this noiſe, I ſaw a Kabobiqua flying as faſt as he could from one of my hunters, while, at the diſtance of a hundred paces farther, three men were making the moſt lamentable clamour, and near them was a young girl lying on the ground. I made a ſignal to my hunter to approach me; but the report of the ſhot, and the howling of the three men, had already ſpread alarm throughout the horde. Some cried out treachery; others ran to their arms; and I now imagined that I was about to be maſſacred, with my whole company, and that I ſhould be obliged to arm them in my defence. My ſituation was the more critical, as neither I, nor any perſon in the kraal, knew what was the cauſe of this confuſion; and if I had known, how could I have explained it?

"Under this embarraſſment, I took the chief by the hand, and advanced with him towards the horde. Fear was painted in his countenance; tears began to drop from his eyes; and he ſpoke to me with great vivacity. He imagined, no doubt, that he was betrayed. He complained to me, and accuſed my people of perfidy; yet he readily followed me.

"As I was without arms, and preſented myſelf with the chief, I was received with confidence, and my appearance ſeemed, in ſome meaſure, to calm their perturbation. My people, who had ſeen me direct my courſe towards the kraal, haſtened thither after me, to protect me; and their number overawed the multitude. At length the whole myſtery was cleared up, and we learned what had occaſioned the tumult.

"A Kabobiqua having met one of my hunters, who was returning with his fuſee, wiſhed to examine it, and begged him to ſhew it to him. In handling it, however, he accidentally touched the trigger; it inſtantly went off; and the ſavage, frightened by the unexpected exploſion, threw down the fuſee, and ran away as faſt as he could.

"At that time, three men of the horde and a young girl happened unluckily to be ſtanding, at the diſtance of a hundred paces, in the direction of the piece. The latter received a ſingle grain of ſhot in the cheek; and the others a few grains in the legs and thighs. The author of the misfortune confirmed this explanation; tranquillity was ſoon reſtored; the ſavages depoſited their arms; and I was ſurrounded only by friends as before.

"Nothing remained but to enquire into the ſtate of the wounded, and to give them every aſſiſtance in my power. Without loſs of time, therefore, I repaired, ſtill accompanied by the chief, to the place where they were. By the way we met the young girl, who was returning from the kraal, bathed in tears. The cauſe of her uneaſineſs was a grain of lead, which had, however, penetrated ſo little, that I forced it out by only preſſing the part with my fingers. With regard to the three men, they lay rolling on the ground, howling in a moſt frightful manner, and exhibiting every ſymptom of deſpair.

"I was aſtoniſhed at their conſternation, and could not conceive how men inured to ſufferings ſhould be ſo much affected by a few ſmall punctures, the pain of which could have ſcarcely drawn tears from an infant. They at length told me the cauſe of their wailings. Theſe ſavages, accuſtomed to poiſon their arrows, imagined that I had in like manner poiſoned the lead with which they were wounded. They had, therefore, given themſelves up as loſt, and expected in a few moments to expire."

It was with great difficulty that our author could convince them that they had nothing to fear. He ſhewed them in the fleſh of his own leg a dozen of ſhots of lead; but they were not ſatisfied till one of the moſt intelligent of his Hottentots, taking from his ſhot bag a few grains of lead, and ſhewing them to the three men, immediately ſwallowed them. This concluſive argument produced the deſired effect. The cries of the wounded men inſtantly ceaſed; ſerenity again appeared in their faces; and their wounds were no more mentioned.

The Kabobiquas have neither the flat noſe nor plump cheeks of the Hottentots. Their ſkin alſo has not that baſtard colour, which, being neither black nor white, renders them odious to both races; nor do they beſmear their bodies with thoſe diſguſting fat ſubſtances, on account of which one cannot approach them without being bedaubed with their filth, or acquiring an offenſive ſmell. In ſtature they are as tall as the Caffres, and their colour is equally black. Their hair, which is exceedingly ſhort, and much curled, is ornamented with ſmall copper buttons, arranged with great art and ſymmetry. Inſtead of that apron made of a jackal's ſkin, employed by the Hottentot to cover what modeſty bids him conceal, the Kabobiquas uſe a round piece of leather, the edge of which is ornamented with a ſmall indented circle of copper, and which is divided into different compartments by rows of glaſs beads of various colours, all proceeding from the centre, and diverging towards the circumference, like the rays in our images of the ſun.

This kind of veil is made faſt to the groin by means of a girdle; but as it is only four inches in diameter, as it is deranged by the ſmalleſt movement, and as they give themſelves little uneaſineſs reſpecting ſuch accidents, it is very ill ſuited to the purpoſe for which it is applied. During the great heats, this ſmall and almoſt uſeleſs apron is the only covering on their bodies. Its being ſo readily diſplaced, enabled our author to aſcertain that they do not practiſe circumciſion; but it ſeemed to ſhow alſo, that, in regard to modeſty, their ideas are very different from ours.

Though they go thus almoſt entirely naked, their manners, inſtead of being licentious, are remarkably chaſte. No females can be more prudent or more reſerved than their women; and whether from refinement of coquetry, or the effect of prudence, they do not tattoo their faces like their huſbands and fathers. They do not even follow their example in ornamenting their hair with copper buttons; and they always go barelegged, though moſt of them wear ſandals.

Their dreſs conſiſts of an apron that reaches only half down the thigh; a kroſs which, paſſing under the arm-pits, is tied on the breaſt; and a long mantle like that of the men. The mantle is made of ſkins not deprived of the hair; and the kroſs of tanned leather, prepared like that uſed for gloves in Europe.

With regard to glaſs beads, they wear them as bracelets. They form them alſo into necklaces, which deſcend in different rows to the pit of the ſtomach; and they ſuſpend from their girdles ſeveral ſtrings of them, which fall down their thighs below the apron.

Theſe ornaments being very durable, the habit of ſeeing them renders the women almoſt indifferent to the pleaſure of poſſeſſing them. Thoſe they procured from our author afforded at firſt great ſatisfaction, on account of their novelty. But when he ſhewed them ſciſſars and needles, they gave the preference to theſe articles; and this choice does honour to the good ſenſe of the Kabobiqua ladies. Like their chief, they ſet a higher value on utility than ornament.

Before our author's arrival among them, the Kabobiquas were acquainted with the uſe of tobacco through the means of ſome of the tribes more contiguous to the Cape. It was, however, a luxury which they could ſeldom enjoy; and ſo indifferent were they about it, that if it were not brought to them, they would not go a ſtep to procure it. This indifference, about an article which is eagerly ſought for by all the tribes of Hottentots, ſeemed to ſhew that there are traits in the character of the Kabobiquas which diſtinguiſh them from their ſouthern neighbours. The caſe was the ſame as to ſtrong liquors, on which they ſet no great value; and though there were among them ſome few individuals diſpoſed to reliſh them, the greater number abſolutely refuſed them.

"If the contents of my flaſks (ſays Vaillant) gave them little ſatisfaction, they were, however, much captivated with the flaſks themſelves. Theſe tranſparent bottles excited their admiration in the higheſt degree. They called them *ſolid water;* for, notwithſtanding the heat of the climate, theſe ſavages had ſeen ice on the ſummits of the mountains by which they are ſurrounded; and they entertained no doubt that the glaſs of my flaſks was water, which I had rendered ſolid by magic, and which I prevented their fires from melting. As it was impoſſible for me to explain this matter, I did not attempt to undeceive them: and beſides, with what advantage would it have been attended? I ſuffered them, therefore, to continue in their error, and contented myſelf with conferring on them an obligation, by giving them all the empty bottles for which I had no uſe.

"On their part, they vied with each other in ſhewing

ing their generoſity towards me; and I muſt indeed allow, that I never ſaw a nation ſo diſintereſted. Every night they brought to my camp a conſiderable quantity of milk; and they never came to ſpend the evening with my people, without bringing ſome ſheep to regale them. I have ſeen many of them give away gratuitouſly, and without receiving any thing in return, part of their herds and their flocks; and, when I departed, there were many perſons in my caravan who poſſeſſed both ſheep and oxen, which they had received as a pure gift."

With this benevolent diſpoſition, the Kabobiquas have alſo a martial character. Their weapons are poiſoned arrows, and a lance with a long iron point, but different from the aſſagay of the Hottentots. In battle, their defenſive armour conſiſts of two bucklers; the one of a ſize ſufficient to cover the whole body of the combatant; the other much ſmaller. They are both made of ſkins exceedingly thick, and proof againſt arrows.

The courage which the Kabobiquas diſplay in combat is particularly exerciſed in their hunting excurſions, and, above all, againſt carnivorous animals. Intrepid, however, as it may be to attack the elephant and the rhinoceros, theſe ſpecies of animals are not objects of their vengeance; becauſe, living upon graſs and herbs, they have nothing to apprehend from them, either for themſelves or their cattle. But the tiger, lion, hyæna, and panther, being enemies of a different kind, they declare againſt them implacable war, and purſue them without remiſſion.

Of the ſpoils of theſe deſtructive animals they form their bucklers, girdles, ſandals, kroſſes, mantles, &c. They conſider it as a mark of honour to wear them; and they ſet a much higher value upon them than upon the ſkin of the rhinoceros or of the elephant. If they ſometimes hunt the latter, it is only as objects of food; and they employ to catch them thoſe concealed pits, which are the uſual ſnares of the Hottentots: but this method, which requires both patience and labour, is very little ſuited to a people ſo brave and enterpriſing as the Kabobiquas.

As they poſſeſs ſo bold and reſolute a character, one might be induced to believe that they are ferocious and intractable. Among all the African nations, however, which our author viſited, he never knew one that ſo much practiſed obedience and ſubordination.

The chief here is not, as in other tribes, a principal among his equals; he is a ſovereign in the midſt of his ſubjects, a maſter ſurrounded by his ſlaves. A word, a geſture, or a look, is ſufficient to procure him obedience. Whatever be his orders, they are never contradicted; and the caſe is the ſame in every particular family. What the chief is to the horde, the father is to his children. His commands are abſolute; and he exerciſes regal power at home, while he obeys elſewhere.

Though the tribe was very numerous, the wiſdom with which it was ruled, and the good order that prevailed, announced, in the man by whom it was governed, an intelligence ſuperior to that of all the ſavages our author had before ſeen; for he had not then viſited the Houzouanas. The habitation of this chief was ſuited to his ſupreme dignity. It was, indeed, a hut only, like thoſe of his ſubjects, and, like them covered with the ſkins of animals; but it was much larger, as well as more elevated; and around it were ſix others, occupied by his family, and deſtined for them alone.

The natural dryneſs of the country inhabited by the Kabobiquas obliges them to dig wells, for their own uſe as well as for their cattle; but as the ſame cauſe often dries up theſe wells, they are then forced to remove, and to ſeek elſewhere a ſoil more abundant in ſprings; for Fiſh-River, though conſiderable in the rainy ſeaſon, is often, during the great heats, entirely deſtitute of water.

The long journeys which theſe too frequent emigrations compel them to undertake, and the intercourſe which they thence have with other nations, muſt neceſſarily inſpire them with ideas unknown to the ſettled tribes; and it would not be unnatural to ſuppoſe, that to this extenſion of ideas are they indebted for that ſuperiority of intelligence which elevates them above their neighbours.

Of the religion of the Kabobiquas, our author talks very inconſiſtently, and like a true philoſopher of the French ſchool. "Of all the African nations (ſays he), they are the only people among whom I found any idea, however confuſed a one, of the exiſtence of a Deity. I do not know whether it be from their own reflection, or the communications of other tribes, that they have acquired this ſublime knowledge, which would alone bring them near to a level with poliſhed nations; but they believe, as far as I have been able to learn from my people, that beyond the ſtars there exiſts a Supreme Being, who made and who governs all things. I muſt however obſerve, that on this ſubject their ideas are vague, barren, and unproductive. They have no conception of the future exiſtence of the ſoul, or of rewards and puniſhments in another life; in ſhort, they have neither worſhip, ſacrifices, ceremonies, nor prieſts, and are total ſtrangers to what we call religion."

This is impoſſible. A people believing in a Supreme Being, who made and who governs all things, *may* indeed be without *ſacrifices*, *ceremonies*, and *prieſts;* but ſuch a people cannot avoid *wiſhing*, that the Being who governs all things may protect them. Such a wiſh is a prayer; and ſurely he who prays is no ſtranger to religion. M. Vaillant places the country of the Kabobiquas between 23° and 25° S. Lat. and 16° 25′ and 19° 25′ Long. eaſt from Paris.

KAHNONWOLOHALE, the principal village of the Oneida Indians, in which is Oneida Caſtle, about 20 miles ſouth of weſt from Whiteſtown, and 12 weſt of Paris. There is but one framed houſe in this village. Their habitations are but a ſmall improvement upon the ancient *wigwams;* and are ſcattered ſparſely throughout an encloſure of ſeveral miles in circumference, within which they keep their cattle, horſes, and ſwine, and without, plant their corn and ſow their grain.—*Morſe.*

KAJAAGA, an African kingdom, called by the French *Gallam*, is bounded on the ſouth-eaſt and ſouth by Bambouk; on the weſt, by Bondou and Foota Torra; and on the north, by the river Senegal. The air and climate (ſays Mr Park) are more pure and ſalubrious than at any of the ſettlements towards the coaſt; the face of the country is every where interſperſed with a pleaſing variety of hills and valleys; and the windings of the Senegal river, which deſcends from the rocky hills of the interior, make the ſcenery on its banks very pictureſque and beautiful.

The inhabitants are called Serawoollies, or (as the French write it) *Seracolets*. Their complexion is a jet black: they are not to be diſtinguiſhed in this reſpect from the Jaloffs.

The government is monarchical; and the regal authority, from what I experienced of it, ſeems to be ſufficiently formidable. The people themſelves, however, complain of no oppreſſion; and ſeemed all very anxious to ſupport the king in a conteſt he was going to enter into with the ſovereign of Kaſſon. The Serawoollies are habitually a trading people; they formerly carried on a great commerce with the French in gold and ſlaves, and ſtill maintain ſome traffic in ſlaves with the Britiſh factories on the Gambia. They are reckoned tolerably fair and juſt in their dealings, but are indefatigable in their exertions to acquire wealth, and they derive conſiderable profits by the ſale of ſalt and cotton cloth in diſtant countries. When a Serawoolli merchant returns home from a trading expedition, the neighbours immediately aſſemble to congratulate him upon his arrival. On theſe occaſions the traveller diſplays his wealth and liberality, by making a few preſents to his friends; but if he has been unſucceſsful, his levee is ſoon over; and every one looks upon him as a man of no underſtanding, who could perform a long journey, and (as they expreſs it) *bring back nothing but the hair upon his head*.

Their language abounds much in gutturals, and is not ſo harmonious as that ſpoken by the Foulahs: it is, however, well worth acquiring by thoſe who travel through this part of the African continent; it being very generally underſtood in the kingdoms of Kaſſon, Kaarta, Ludamar, and the northern parts of Bambara. In all theſe countries the Serawoollies are the chief traders.

Joag, the frontier town of this kingdom as you enter it from Piſania, may be ſuppoſed, on a groſs computation, to contain two thouſand inhabitants. It is ſurrounded by a high wall, in which are a number of port holes, for muſquetry to fire through in caſe of an attack. Every man's poſſeſſion is likewiſe ſurrounded by a wall; the whole forming ſo many diſtinct citadels; and amongſt a people unacquainted with the uſe of artillery, theſe walls anſwer all the purpoſes of ſtronger fortifications. To the weſtward of the town is a ſmall river, on the banks of which the natives raiſe great plenty of tobacco and onions. Mr Park was in this town plundered of half his effects by order of the king, becauſe forſooth he had neglected to pay the accuſtomed duties before he entered the kingdom; and it required a good deal of addreſs to prevent himſelf and his attendants from being made ſlaves; a ſtate to which the law, it was ſaid, condemned them for the commiſſion of this unintended crime. He was at laſt reſcued from Joag by a nephew of the king of Kaſſon. Joag is placed by Major Rennel in 14° 25′ N. Lat. and 9° 46′ W. Long.

KAINSI is the name given by the Hottentots to a particular ſpecies of antelope, of which, according to Vaillant, no author has yet given a perfect deſcription. It is called by the Dutch *klip-ſpringer*, on account of the eaſe with which it leaps from rock to rock; and indeed of all the antelopes there is no one equal to it in agility. It is about the ſize of a kid of a year old, and of a yellowiſh grey colour; but its hair has this peculiarity, that, inſtead of being round, pliable, and firm, like that of moſt other quadrupeds, it is flat, harſh, and ſo little adherent to the ſkin, that the ſlighteſt friction makes it fall off. Nothing is more eaſy, therefore, than to deprive this animal of its hair: dead or alive it is the ſame; to rub, or even to touch the animal, is ſufficient. Another peculiarity of this ſingular hair is its being extremely fragile; ſo that if you take a tuft of it between your fingers, and twiſt it with the other hand, it will break like the barbs of a feather. This property, however, belongs not excluſively to the hair of the kainſi; for our author ſays he has obſerved it in the hair of other quadrupeds, which in the ſame manner live among the rocks.

This antelope differs from the other ſpecies alſo in the ſhape of the foot, which, inſtead of being pointed like theirs, is rounded at the end; and as it is always accuſtomed, both in leaping and walking, to tread with the point of the hoof, without reſting at all on the heel, it leaves a print diſtinguiſhable from that of any other antelope in Africa. Its fleſh is exquiſitely flavoured, and much ſought after, particularly by the hunters.

The chace of the kainſi is very amuſing. It is true, it is ſcarcely poſſible to hunt it down with dogs, as it ſoon eſcapes them by means of its inconceivable agility, and gets out of their reach on the point of ſome detached rock, where it will remain whole hours ſafe from all purſuit, and ſuſpended, as it were, above the abyſs. But in this ſituation it is excellently placed for the arrow or the ball of the huntſman; who is commonly certain of ſhooting it at pleaſure, though he is not always able to come at it when killed. We ſhall give our author's account of a chace of the kainſi in his own words.

" I was hunting (ſays he) one of theſe animals, when, from the nature of the place, it found itſelf ſo preſſed by my dogs, as to be on the point of being run down and taken. There were apparently no means of eſcape; ſince before it was a vaſt perpendicular rock, by which its courſe was neceſſarily ſtopped. In this wall, however, which appeared to me perfectly ſmooth, was a little ridge, projecting at moſt not above *two inches*, which the kainſi quickly perceived, and, leaping upon it, to my great aſtoniſhment kept itſelf *firm* (A). I imagined, that at any rate it muſt ſoon tumble down; and my dogs, too, ſo fully expected it, that they ran to the bottom of the rock, to be ready to catch it when it fell. To haſten its fall, I endeavoured to haraſs it, and make it loſe its equilibrium; and for this purpoſe I pelted it with ſtones. All at once, as if gueſſing my deſign, it collected its whole ſtrength, bounded over my head, and, falling a few paces from me, darted away with the utmoſt ſpeed. Notwithſtanding the rapidity of its flight, it would have been eaſy for me to have ſhot it; but its leap had ſo ſurpriſed and amuſed me, that I gave it its life." This was generous, if the ſtory be true.

KAMTSCHATKA is inhabited by a people, who are repreſented in the *Encyclopædia* as poſſeſſing almoſt every quality that can diſgrace human nature. We think

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(A) This we think incredible.

think it incumbent upon us to acknowledge, in this place, that a much more favourable picture of them is drawn by La Perouſe who viſited Kamtſchatka in September 1787. The Ruſſian governor made the commodore and his officers remark the promiſing appearance of ſeveral ſmall fields of potatoes, of which the ſeed had been brought from Irkoutſk a few years before; and purpoſed to adopt mild, though infallible means, of making farmers of the Ruſſians, Coſſacks, and Kamtſchadales. The ſmall-pox in 1769 ſwept away three-fourths of the individuals of the latter nation, which is now reduced to leſs than four-thouſand perſons, ſcattered over the whole of the peninſula; and which will ſpeedily diſappear altogether, by means of the continual mixture of the Ruſſians and Kamtſchadales, who frequently intermarry. A mongrel race, more laborious than the Ruſſians, who are only fit for ſoldiers, and much ſtronger, and of a form leſs diſgraceful to the hand of nature, than the Kamtſchadales, will ſpring from theſe marriages, and ſucceed the ancient inhabitants. The natives have already abandoned the *yourts*, in which they uſed to burrow like badgers during the whole of the winter, and where they breathed an air ſo foul as to occaſion a number of diſorders. The moſt opulent among them now build *iſbas*, or wooden houſes, in the manner of the Ruſſians. They are preciſely of the ſame form as the cottages of our peaſants; are divided into three little rooms; and are warmed by a brick ſtove, that keeps up a degree of heat (A) inſupportable to perſons unaccuſtomed to it. The reſt paſs the winter, as well as the ſummer, in *balagans*, which are a kind of wooden pigeon-houſes, covered with thatch, and placed upon the top of poſts twelve or thirteen feet high, to which the women as well as the men climb by means of ladders that afford a footing very inſecure. But theſe latter buildings will ſoon diſappear; for the Kamtſchadales are of an imitative genius, and adopt almoſt all the cuſtoms of their conquerors. Already the women wear their hair, and are almoſt entirely dreſſed, in the manner of the Ruſſians, whoſe language prevails in all the *oſtrogs*; a fortunate circumſtance, ſince each Kamtſchadalian village ſpoke a different jargon, the inhabitants of one hamlet not underſtanding that of the next. It may be ſaid in praiſe of the Ruſſians, that though they have eſtabliſhed a deſpotic government in this rude climate, it is tempered by a mildneſs and equity that render its inconveniences unfelt. They have no reproaches of atrocity to make themſelves, like the Spaniards in Mexico and Peru. The taxes they levy on the Kamtſchadales are ſo light, that they can only be conſidered as a mark of gratitude towards the ſovereign, the produce of half a day's hunting acquitting the impoſts of a year. It is ſurpriſing to ſee in cottages, to all appearance more miſerable than thoſe of the moſt wretched hamlets in our mountainous provinces, a quantity of ſpecie in circulation, which appears the more conſiderable, becauſe it exiſts among ſo ſmall a number of inhabitants. They conſume ſo few commodities of Ruſſia and China, that the balance of trade is entirely in their favour, and that it is abſolutely neceſſary to pay them the difference in rubles. Furs at Kamtſchatka are at a much higher price than at Canton; which proves, that as yet the market of Kiatcha has not felt the advantageous effect of the new channel opened in China.

Our author compares Kamtſchatka, with reſpect to climate and ſoil, to the coaſt of Labrador in the vicinity of the Straits of Belle-Iſle; but the men, like the animals, are there very different. The Kamtſchadales appeared to him the ſame people as thoſe of the bay of Caſtries, upon the coaſt of Tartary. Their mildneſs and their probity are the ſame, and their perſons are very little different. They ought then no more to be compared to the Eſquimaux Indians, than the ſables of Kamtſchatka to the martins of Canada.

The Greek religion has been eſtabliſhed among the Kamtſchadales without perſecution or violence, and with extraordinary facility. The vicar of Paratounka is the ſon of a Kamtſchadale and of a Ruſſian woman. He delivers his prayers and catechiſm with a tone of feeling very much to the taſte of the aborigines, who reward his cares with offerings and alms, but pay no tythes. The canons of the Greek church permitting prieſts to marry, we may conclude that the morals of the country clergymen are ſo much the better. "I believe them, however (ſays Perouſe), to be very ignorant; and do not ſuppoſe, that for a long time to come they will ſtand in need of greater knowledge. The daughter, the wife, and the ſiſter of the vicar, were the beſt dancers of all the women, and appeared to enjoy the beſt ſtate of health. The worthy prieſt knew that we were good Catholics, which procured us an ample aſperſion of holy water; and he alſo made us kiſs the croſs that was carried by his clerk; theſe ceremonies were performed in the midſt of the village. His parſonage-houſe was a tent, and his altar in the open air; but his uſual abode is Paratounka, and he only came to St Peter and St Paul's to pay us a viſit."

The people of Kamtſchatka have inured themſelves to the extremes of heat and cold. It is well known, that their cuſtom in Europe, as well as in Aſia, is to go into vapour baths, come out covered with perſpiration, and immediately roll themſelves in the ſnow. The *oſtrog* of St Peter had two of theſe public baths, into which our author went before the fires were lighted. They conſiſt of a very low room, in the middle of which is an oven conſtructed of ſtones, without cement, and heated like thoſe intended to bake bread. Its arched roof is ſurrounded by ſeats one above another, like an amphitheatre, for thoſe who wiſh to bathe, ſo that the heat is greater or leſs according as the perſon is placed upon a higher or lower bench. Water thrown upon the top of the roof, when heated red hot by the fire underneath, is converted inſtantly into vapour, and excites the moſt profuſe perſpiration. The Kamtſchadales have borrowed this cuſtom, as well as many others, from their conquerors; and ere long the primitive character that diſtinguiſhed them ſo ſtrongly from the Ruſſians will be entirely effaced.

Our author deſcribes the bay of Avatſcha as the fineſt, the moſt convenient, and the ſafeſt, that is to be met with in any part of the world. The entrance is narrow, and ſhips would be forced to paſs under the guns of the forts that might be eaſily erected. The

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(A) Not leſs than thirty degrees of Reaumur's thermometer.

bottom is mud, and excellent holding ground. Two vaſt harbours, one on the eaſtern ſide, the other on the weſtern, are capable of containing all the ſhips of the French and Engliſh navy. The rivers of Avatſcha and Paratounka fall into this bay, but they are choaked up with ſand-banks, and can only be entered at the time of high water. The village of St Peter and St Paul is ſituated upon a tongue of land, which, like a jetty made by human art, forms behind the village a little port, ſhut in like an amphitheatre, in which three or four veſſels might lie up for the winter. The entrance of this ſort of baſon is more than twenty-five toiſes wide; and nature can afford nothing more ſafe or commodious. On its ſhore the governor propoſed to lay down the plan of a city, which ſome time or other will be the capital of Kamtſchatka, and perhaps the centre of an extenſive trade with China, Japan, the Phillippines, and America. A vaſt pond of freſh water is ſituated northward of the ſite of this projected city; and at only three hundred toiſes diſtance run a number of ſtreamlets, the eaſy union of which would give the ground all the advantages neceſſary to a great eſtabliſhment. Of theſe advantages Mr Kaſloff underſtood the value; "but firſt (ſaid he a thouſand times over) we muſt have bread and hands, and our ſtock of both of them is very ſmall." He had, however, given orders, which announced a ſpeedy union of the other *oſtrogs* to that of St Peter and St Paul, where it was his intention immediately to build a church. By obſervation, St Peter and St Paul was found to be in 53° 1′ N. Lat. and 156° 30′ E. Long. from Paris.

KANAWA, or *Kanhawa*, a large mountainous county on the weſtern line of Virginia, having the Ohio river on the north-weſt, and Kentucky weſt. The population of this county is included in Green Briar, being 6,015 inhabitants, including 319 ſlaves. About 7 miles from the mouth of Elk river in this county, is a burning ſpring, capacious enough to hold 40 gallons. A bituminous vapour conſtantly iſſues from it, which agitating the ſand around it, gives it the appearance of a boiling ſpring. On preſenting a torch within 18 or 20 inches of the mouth, it flames up in a column, 4 or 5 feet in height, and about 18 inches diameter, and which ſometimes burns 20 minutes, and at other times has continued 3 days. General Clarke kindled the vapour, ſtaid about an hour, and left it burning.—*Morſe.*

KANAWAGERES, an Indian village on the weſt ſide of Geneſſee river, 4 miles weſt-ſouth-weſt of Hartford in the Geneſſee country in New-York.—*ib.*

KANEM, is the name given by Edriſi to the kingdom of Bornou in Africa, of which the reader will find ſome account in the *Encyclopædia*. In ſome particulars, however, that account is incorrect. The kingdom of Bornou or Kanem muſt extend farther eaſt and farther north than it is there ſaid to do; for according to the lateſt and beſt accounts, its capital ſtands in Lat. 24° 32′ Long. 22° 57′. The empire is ſaid to be very extenſive; and if it be true, as we learn from the proceedings of the African Aſſociation, that its ſovereign is more powerful than the Emperor of Morocco, the people cannot be ſuch abſolute brutes, as we have repreſented them in the article referred to; for the ſovereign of brutes would have no power. The truth, however is, that very little is yet known in Europe of Bornou or its inhabitants.

KANHAWAY, GREAT, a river of Virginia of conſiderable note for the fertility of its lands, and ſtill more as leading towards the head waters of James's river. But it is doubtful whether its great and numerous rapids will admit a navigation, but at an expenſe to which it will require ages to render its inhabitants equal. The great obſtacles begin at what are called the Great Falls, 90 miles above the mouth, below which are only 5 or 6 rapids, and theſe paſſable with ſome difficulty even at low water. From the falls to the mouth of Green Briar is 100 miles. It is 280 yards wide at its mouth. The head waters of this river are in the weſtern part of North Carolina, in the moſt eaſterly ridge of the Alleghany or Appalachian mountains, and ſouth of the 36th degree of latitude. Its head branches encircle thoſe of the Holſton, from which they are ſeparated by the Iron Mountain, through which it paſſes 10 miles above the lead mines. About 60 miles from Little river it receives Green Briar river from the eaſt, which is the only conſiderable tributary ſtream in all that diſtance. About 40 miles below the mouth of Green Briar river, in Virginia, in the Kanhaway, is a remarkable cataract. A large rock, a little elevated in the middle, croſſes the bed of the river, over which the water ſhoots, and falls about 50 feet perpendicularly, except at one ſide where the deſcent is more gradual. The great Kanhaway is 196 miles below Pittſburg, and is navigable moſt of the year; and a waggon road may be made through the mountain, which occaſions the falls, and by a portage of a few miles only, a communication may be had between the waters of Great Kanhaway and Ohio, and thoſe of James's river in Virginia. Down this river great quantities of goods are conveyed up the Kentucky river, others on horſeback or in waggons to the ſettled part, and ſold on an average, at 100 per cent. advance.—*Morſe.*

KANHAWAY, LITTLE, a ſmall navigable river of Virginia, which is 150 yards wide at its mouth, and is navigable 10 miles only. Perhaps its northerly branch, called Junius Creek, which interlocks with the weſtern waters of Monongahela, may one day admit a ſhorter paſſage from the latter into the Ohio.—*ib.*

KANT (Immanuel), Royal Profeſſor of Morals and Metaphyſics in the Univerſity of Königſberg, is conſidered by his admirers as the greateſt philoſopher that Germany ever produced. Were we to form an eſtimate of his merits from the different views that have been given in Engliſh of his celebrated ſyſtem, we certainly ſhould not conſider him as entitled to that character; for thoſe views are obſcured by new and uncouth terms, and are altogether wrapt up in a ſtyle which approaches nearer to jargon than to the luminous compoſition of a man who thinks with clearneſs and preciſion. We readily admit, that it is very difficult to tranſlate a novel ſyſtem of metaphyſics from one language into another; for the tranſlator, to perform his taſk properly, muſt be not only a complete maſter of both languages, but alſo a profound metaphyſician; and not one of the tranſlators or abridgers of the works of Kant into our language appears to us poſſeſſed of both theſe qualities. Deſpairing, from our ſcanty knowledge of the German language, of performing ourſelves what ſo many others have failed to perform, we have applied for aſſiſtance to an illuſtrious Frenchman, who has reſided many years in Germany, who is maſter of both languages, who is a profound metaphyſician, and whoſe name, were we at liberty to publiſh it, would reflect luſtre upon our Work. From him we have reaſon to expect a clear and comprehenſive view of the *Critical Philosophy*, as Kant terms his ſyſtem; but ſhould we be diſappointed of our expectation, we ſhall, under that title, lay before our readers a *ſpecimen* of the ſyſtem from the different views of it which have been publiſhed in our own tongue.

KANTUFFA, a ſpecies of thorn peculiar to Abyſſinia, is thus deſcribed by Mr Bruce: The branches ſtand two and two upon the ſtalk; the leaves are diſpoſed two and two likewiſe, without any ſingle one at the point, whereas the branches bearing the leaves part from the ſtalk: at the immediate joining of them are two thick thorns placed perpendicular and parallel alternately; but there are alſo ſingle ones diſtributed in all the interſtices throughout the branch.

The male plant has a one-leaved perianthium, divided into five ſegments, and this falls off with the flower. The flower is compoſed of five petals, in the middle of which riſe ten ſtamina or filaments, the outer row ſhorter than thoſe of the middle, with long ſtigmata, having yellow farina upon them. The flowers grow in a branch, generally between three and four inches long, in a conical diſpoſition, that is, broader at the baſe than the point. The inſide of the leaves are a vivid green, in the outſide much lighter. It grows in form of a buſh, with a multitude of ſmall branches riſing immediately from the ground, and is generally ſeven or eight feet high. Our author ſaw it when in flower only, never when bearing fruit. It has a very ſtrong ſmell, reſembling that of the ſmall ſcented flower called mignionet, ſown in vaſes and boxes in windows, or rooms, where flowers are kept.

Our author repreſents the kantuffa as ſo very troubleſome, that it renders travelling through ſome places of Abyſſinia almoſt impoſſible. The ſoldier ſcreens himſelf from it by a goat's, a leopard's, or a lion's ſkin thrown over his ſhoulder, of which it has no hold. As his head is bare, he always cuts his hair ſhort before he goes to battle, leſt his enemy ſhould take advantage of it; but the women, wearing their hair long, and the great men, whether in the army or travelling in peace, being always clothed, it never fails to incommode them, whatever ſpecies of raiment they wear. If their cloak is fine muſlin, the leaſt motion againſt it puts it all in rags; but if it is a thick, ſoft cloth, as thoſe are with which men of rank generally travel, it buries its thorns, great and ſmall, ſo deep in it, that the wearer muſt either diſmount and appear naked, which to principal people is a great diſgrace, or elſe much time will be ſpent before he can diſengage himſelf from its thorns. In the time when one is thus employed, it rarely fails to lay hold of you by the hair, and that again brings on another operation, full as laborious, but much more painful, than the other. A proclamation is therefore iſſued, every year immediately before the king commences any march, in theſe words; "Cut down the kantuffa in the four quarters of the world; for I do not know where I am going." The wild animals, both birds and beaſts, eſpecially the Guinea fowl, know how well it is qualified to protect them. In this ſhelter, the hunter in vain could endeavour to moleſt them, were it not for a hard-haired dog, or terrier of the ſmalleſt ſize, who being defended from the thorns by the roughneſs of his coat, goes into the cover, and brings them and the partridges alive one by one to his maſter.

KAPPAS, a tribe of Illinois Indians, in Louiſiana: they lie a little above the Sothouis. This nation was formerly very numerous before the diſcovery of the Miſſiſſippi. The country they inhabit has good paſturage.—*Morse.*

Kappas *Old Fort*, in Louiſiana, ſtands on the Miſſiſſippi, at the mouth of the river St Francis. It was built by the French principally for a magazine of ſtores and proviſions, during the wars with the Chicaſaws; by whom their Illinois convoys were conſtantly attacked and frequently deſtroyed.—*ib.*

KARATUNK, or *Carytunk*, a plantation in Lincoln county, Diſtrict of Maine, conſiſting of about 20 families or 103 inhabitants. It is the uppermoſt on Kennebeck river, 14 miles north of Brookfield.—*ib.*

KASKASKIAS *Village* lies on the S. W. bank of the river of the ſame name, a water of the Miſſiſſippi, in the N. W. Territory, oppoſite Old Fort, and 12 miles from the mouth of the river, but not half that diſtance from the Miſſiſſippi. It contains 80 houſes, many of them well built; ſeveral of ſtone, with gardens, and large lots adjoining. About 20 years ago it contained about 500 whites, and between 4 and 500 negroes. The former have large ſtocks of black cattle, ſwine, &c.—*ib.*

Kaskaskias, an Indian nation near the river of their name in the N. W. Territory. They can furniſh 250 warriors. Three miles northerly of Kaſkaſkias is a village of Illinois Indians, of the Kaſkaſkias tribe; containing about 210 perſons, and 60 warriors. They were formerly brave and warlike, but are now degenerated and debauched. At the late peace, the United States granted them a ſum of money in hand, and became bound to pay them 500 dollars a year forever. —*ib.*

Kaskaskias, a river of the N. W. Territory which is navigable for boats 130 miles. Its courſe is S. S. W. and near its mouth it turns to the S. S. E. and flows into the Miſſiſſippi river 84 miles from the Illinois. It runs through a rich country, abounding in extenſive natural meadows, and numberleſs herds of buffaloe, deer, &c. High grounds lie along the eaſt ſide of the river, the banks being compoſed of lime-ſtone and free-ſtone, and are from 100 to 130 feet high, divided in many places by deep cavities, through which many ſmall rivulets paſs before they fall into the Miſſiſſippi. The ſides of theſe hills, fronting the river, are in many places perpendicular, and appear like ſolid pieces of maſonry, of various colours, figures, and ſizes.—*ib.*

KASKASKUNK, a town of the Delawares, between Great Beaver creek and Alleghany river, in Pennſylvania. Here the Moravian miſſionaries had a ſettlement. It is 40 miles north of Pittſburg.—*ib.*

KASKINOMPA, a ſmall river which runs weſt, into the Miſſiſſippi from the State of Tenneſſee, in N. lat. 36° 28′. On the north ſide of its mouth is an iron mine.—*ib.*

KASSON, a populous kingdom in North Africa, of which the capital *Kooniakary* is placed by Major

Rennel in 14° 33′ N. Lat. and 8° 43′ W. Long. The king who reigned when Mr Park was in the country was extremely kind to our traveller, though his ſon plundered him unmercifully, like other rapacious chiefs of that ſavage country. From the top of a high hill, at ſome diſtance from the capital, "I had (ſays Mr Park) a moſt enchanting proſpect of the country. The number of towns and villages, and the extenſive cultivation around them, ſurpaſſed every thing I had yet ſeen in Africa. A groſs calculation may be formed of the number of inhabitants in this delightful plain, by conſidering, that the king of Kaſſon can raiſe four thouſand fighting men by the ſound of his war drum."

At Teeſee, a large unwalled town, where our author reſided for ſome days, he had an opportunity of obſerving the cuſtoms of the inhabitants, who conſiſted partly of Pagans and partly of Buſhreens, *i. e.* of negroes converted to Mahomedaniſm. Though theſe people poſſeſs both cattle and corn in abundance, rats, moles, ſquirrels, ſnakes, locuſts, &c. are eaten without ſcruple by the higheſt and loweſt. Another cuſtom, ſtill more extraordinary, is, that no woman is allowed *to eat an egg*. This prohibition, whether ariſing from ancient ſuperſtition, or from the craftineſs of ſome old Buſhreen who loved eggs himſelf, is rigidly adhered to; and nothing will more affront a woman of Teeſee than to offer her an egg. The cuſtom is the more ſingular, as the men eat eggs without ſcruple in the preſence of their wives, and Mr Park never obſerved the ſame prohibition in any other of the Mandingo countries.

Our author was preſent at a palaver held by the governor of Teeſee on a very extraordinary occaſion; of which we ſhall give his account at full length, becauſe it ſhows how free men are reduced to ſlavery in North Africa. "The caſe was this. A young man, a Kafir, of conſiderable affluence, who had recently married a young and handſome wife, applied to a very devout Buſhreen, or Muſſulman prieſt, of his acquaintance, to procure him ſaphies for his protection during the approaching war. The Buſhreen complied with the requeſt; and in order, as he pretended, to render the ſaphies more efficacious, enjoined the young man to avoid any nuptial intercourſe with his bride for the ſpace of ſix weeks. Severe as the injunction was, the Kafir ſtrictly obeyed; and without telling his wife the real cauſe, abſented himſelf from her company. In the mean time it began to be whiſpered at Teeſee, that the Buſhreen, who always performed his evening devotions at the door of the Kafir's hut, was more intimate with the young wife than he ought to be. At firſt, the good huſband was unwilling to ſuſpect the honour of his ſanctified friend, and one whole month elapſed before any jealouſy roſe in his mind; but hearing the charge repeated, he at laſt interrogated his wife on the ſubject, who frankly confeſſed that the Buſhreen had ſeduced her. Hereupon the Kafir put her into confinement, and called a palaver upon the Buſhreen's conduct. The fact was clearly proved againſt him; and he was ſentenced to be ſold into ſlavery, or to find two ſlaves for his redemption, according to the pleaſure of the complainant. The injured huſband, however, was unwilling to proceed againſt his friend to ſuch extremity, and deſired rather to have him publicly flogged before the governor's gate. This was agreed to, and the ſentence was immediately executed. The culprit was tied by the hands to a ſtrong ſtake; and a long black rod being brought forth, the executioner, after flouriſhing it round his head for ſome time, applied it with ſuch force and dexterity to the Buſhreen's back, as to make him roar until the woods reſounded with his ſcreams. The ſurrounding multitude, by their hooting and laughing, manifeſted how much they enjoyed the puniſhment of this old gallant; and it is worthy of remark, that the number of ſtripes was preciſely the ſame as are enjoined by the Moſaic law, *forty, ſave one.*"

The method of converting the negro nations to the religion of the Arabian Impoſtor is a very ſingular one; and Mr Park ſaw the whole people of Teeſee converted in an inſtant. During his reſidence in that town an embaſſy of ten people belonging to Almami Abdulkader, king of Foota Torra, a country to the weſt of Bondou, arrived at Teeſee; and deſiring Tiggity Sego the governor to call an aſſembly of the inhabitants, announced publicly their king's determination, to this effect: "That unleſs all the people of Kaſſon would embrace the Mahomedan religion, and evince their converſion by ſaying eleven public prayers, he (the king of Foota Torra) could not poſſibly ſtand neuter in the preſent conteſt, but would certainly join his arms to thoſe of Kajaaga." A meſſage of this nature, from ſo powerful a prince, could not fail to create great alarm; and the inhabitants of Teeſee, after a long conſultation, agreed to conform to his good pleaſure, humiliating as it was to them. Accordingly, one and all publicly offered up eleven prayers, which were conſidered a ſufficient teſtimony of their having renounced Paganiſm, and embraced the doctrines of the prophet.

Our author relates a ſtory, which we cannot refuſe ourſelves the pleaſure of inſerting, becauſe it exhibits a very pleaſing picture of the affection and gratitude of the Pagan negroes. In his train was a blackſmith, who had lived ſome years on the Gambia, and who now returned to his own country *Kaſſon*. "Soon after we came in ſight of Jumbo, his native town (ſays Mr Park), his brother, who had by ſome means been appriſed of his coming, came out to meet him, accompanied by a ſinging man: he brought a horſe for the blackſmith, that he might enter his native town in a dignified manner; and he deſired each of us to put a good charge of powder into our guns. The ſinging man now led the way, followed by the two brothers; and we were preſently joined by a number of people from the town, all of whom demonſtrated great joy at ſeeing their old acquaintance the blackſmith, by the moſt extravagant jumping and ſinging. On entering the town, the ſinging man began an extempore ſong in praiſe of the blackſmith, extolling his courage in having overcome ſo many difficulties; and concluding with a ſtrict injunction to his friends to dreſs him plenty of victuals.

"When we arrived at the blackſmith's place of reſidence, we diſmounted and fired our muſkets. The meeting between him and his relations was very tender; for theſe rude children of nature, free from reſtraint, diſplay their emotions in the ſtrongeſt and moſt expreſſive manner. Amidſt theſe tranſports, the blackſmith's aged mother was led forth, leaning upon a ſtaff. Every one made way for her; and ſhe ſtretched out her hand to bid her ſon welcome. Being totally blind, ſhe ſtroked his hands, arms, and face, with great care, and ſeemed highly delighted that her latter days were bleſſed by his return, and that her ears once more heard the muſic of his voice. From this interview I was fully convinced, that whatever difference there is between the Negro and European in the conformation of the noſe and the colour of the ſkin, there is none in the genuine ſympathies and characteriſtic feelings of our common nature.

"During the tumult of theſe congratulations, I had ſeated myſelf apart, by the ſide of one of the huts, being unwilling to interrupt the flow of filial and parental tenderneſs; and the attention of the company was ſo entirely taken up with the blackſmith, that I believe none of his friends had obſerved me. When all the people preſent had ſeated themſelves, the blackſmith was deſired by his father to give them ſome account of his adventures; and ſilence being commanded, he began; and after repeatedly thanking God for the ſucceſs that had attended him, related every material occurrence that had happened to him from his leaving Kaſſon to his arrival at the Gambia; his employment and ſucceſs in thoſe parts; and the dangers he had eſcaped in returning to his native country. In the latter part of his narration, he had frequently occaſion to mention me; and after many ſtrong expreſſions concerning my kindneſs to him, he pointed to the place where I ſat, and exclaimed, *aſſille ibi ſiring*, "ſee him ſitting there." In a moment all eyes were turned upon me; I appeared like a being dropped from the clouds; every one was ſurpriſed that they had not obſerved me before; and a few women and children expreſſed great uneaſineſs at being ſo near a man of ſuch an uncommon appearance. By degrees, however, their apprehenſions ſubſided; and when the blackſmith aſſured them that I was perfectly inoffenſive, and would hurt nobody, ſome of them ventured ſo far as to examine the texture of my clothes; but many of them were ſtill very ſuſpicious; and when by accident I happened to move myſelf, or look at the young children, their mothers would ſcamper off with them with the greateſt precipitation. In a few hours, however, they all became reconciled to me." With theſe worthy people our author ſpent the greater part of two days in feaſting and merriment; the blackſmith accompanied him to the capital; and declared, that he would not leave him while he reſided there.

KATERS KILL, a weſtern branch of Kaats' Kill, in New-York State.—*Morſe.*

KATHTIPPACAMUNCK, an Indian village ſituated on the north ſide of Wabaſh river, at the mouth of Rippacanoe creek, and about 20 miles above the Lower Weau towns. In 1791, before its deſtruction by Generals Scott and Wilkinſon, it contained 120 houſes, 80 of which were ſhingle roofed. The beſt houſes belonged to the French traders. The gardens and improvements around were delightful. There was a tavern with cellars, bar, public and private rooms; and the whole marked no ſmall degree of order and civilization.—*ib.*

KAWAKUSICA, or *Kowſaki*, a lake in the Diſtrict of Maine, laid down in late maps as the head of Paſſamaquoddy river. N. lat. 46° 3'.—*ib.*

KAYADAROSSORA CREEK, in New-York State, about 12 miles weſt of the confluence of Fiſh-creek and Hudſon's river. The celebrated ſprings of Saratoga, 8 or 9 in number, are ſituated on the margin of a marſh formed by a branch of this creek. Alſo the name of a tract of land in Saratoga county, New-York, bounded by the town of Schenectady.—*ib.*

KAY's ISLAND, on the N. W. coaſt of America, lies in north lat. 59° 49', eaſt long. 216° 58'. In the neighbourhood of this iſland, Captain Cook diſcovered ſeveral other iſlands.—*ib.*

KEATE (George, Eſq; F. R. S.), deſcended of an ancient and honourable family, was born about the year 1729 or 1730, and received his education at Kingſton ſchool, under the Rev. Mr Woodeſon. From thence he went to Geneva, where he reſided ſome years; and during his ſtay there, became acquainted with Voltaire, with whom he continued to correſpond many years after he returned to England. After finiſhing the tour of Europe, he ſettled as a ſtudent in the Inner Temple, was called to the bar, and ſometimes attended Weſtminſter Hall; though he did not meet with encouragement enough to induce his perſeverance in his profeſſion, nor indeed does it ſeem probable that he had ſufficient application for it. His firſt literary performance was "Ancient and Modern Rome," a poem, written at Rome in the year 1755, printed in the year 1760, and received with conſiderable applauſe. The next year he publiſhed "A Short account of the Ancient Hiſtory, Preſent Government, and Laws, of the Republic of Geneva, 8vo." This work was compiled during the author's reſidence at Geneva; is a very uſeful one; and is dedicated to Monſieur de Voltaire; to whom he ſays, "When I reflect, that it was in this Republic, whoſe government I have attempted to deſcribe, that I was firſt introduced to your acquaintance; when memory renews the hours of ſocial mirth and refined entertainment which your hoſpitality and converſation afforded me—I cannot but rejoice in this occaſion of expreſſing my gratitude; proud that, as your friendſhip diſtinguiſhed the author of theſe pages in a foreign country, your name may at home adorn his labour." It was at one time the intention of Voltaire to tranſlate this account into French, though he afterwards relinquiſhed the deſign.

The next year, 1762, he produced an "Epiſtle from Lady Jane Gray to Lord Guildford Dudley:" and in 1763, "The Alps," a poem; the ſubject of which comprehends all that chain of mountains known under the general name of the Alps, extending from Italy to Germany, and from France to Tyrol, by whatever denomination they are particularly diſtinguiſhed. Of all the poetical works of Mr Keate, this is entitled to the higheſt praiſe for truth of deſcription, elegance of verſification, and vigour of fancy.

Continuing to employ the preſs, in 1764 he publiſhed "Netley Abbey," which he afterwards, in 1769, enlarged and reprinted: and, in 1765, produced "The Temple Student, an Epiſtle to a Friend;" humourouſly rallying his own want of application to the ſtudy of the law, his preference of the belles lettres, and his conſequent want of ſucceſs in his profeſſion. The death of Mrs Cibber in 1766, of whoſe merits as an actreſs he entertained the higheſt opinion, gave occaſion for a poem to her memory, which celebrates her excellent performances on the ſtage, and laments the loſs the theatre would ſuſtain by her death.

In February 1769, he married Miſs Hudſon; and about the ſame time publiſhed "Ferney; an Epiſtle to

M.

M. de Voltaire." In this poem, after praiſing with energy the various beauties of his friend's poetical works, he introduces the following panegyric on Shakeſpeare :

> Yes ! jealous wits may ſtill for empire ſtrive,
> Still keep the flames of critic rage alive :
> Our Shakeſpeare yet ſhall all his rights maintain,
> And crown the triumphs of Eliza's reign.
> Above controul, above each claſſic rule,
> His tut'reſs Nature, and the world his ſchool,
> On ſoaring pinions borne, to him was given
> Th' ærial range of Fancy's brighteſt heav'n ;
> To bid wrapt thought o'er nobleſt heights aſpire,
> And wake each paſſion with a muſe of fire.
> Revere his genius. To the dead be juſt,
> And ſpare the laurels that o'erſhade the duſt.
> Low ſleeps the bard, *in cold obſtruction laid*,
> Nor aſks the chaplet from a rival's head.
> O'er the drear vault, Ambition's utmoſt bound,
> Unheard ſhall Fame her airy trumpet ſound !
> Unheard alike ; nor grief nor tranſport raiſe
> The blaſt of cenſure, or the note of praiſe ;
> As Raphael's own creation grac'd his hearſe,
> And ſham'd the pomp of oſtentatious verſe,
> Shall Shakeſpeare's honours by himſelf be paid,
> And Nature periſh ere his pictures fade.

This eulogium on Shakeſpeare, in an epiſtle to Voltaire, who had laboured ſo long and ſo ſtrenuouſly to detract from the merit of our immortal bard, ſhews that Mr Keate had not given up his judgment to the ſage of Ferney. How the old and envious ſophiſter would reliſh his friend's conduct, may be eaſily conceived. His feelings were certainly very different from thoſe of the mayor and burgeſſes of Stratford, when, in conſequence of this panegyric on their townſman, they complimented Mr Keate with a ſtandiſh, mounted with ſilver, made out of the famous Mulberry tree planted by Shakeſpeare.

In 1773, he publiſhed " The Monument in Arcadia," a dramatic poem, built on the picture of Pouſſin, mentioned by Abbé du Bos in his " Critical Reflections on Poetry and Painting."

In 1799, Mr Keate produced one of his moſt ſucceſsful works, intitled " Sketches from Nature ; taken and coloured in a Journey to Margate," 2 vols. 12mo. This performance, allowing it to be, as it really is, an imitation of Sterne's " Sentimental Journey ;" yet contains ſo many pleaſing delineations of life, ſo many ſtrokes of humour, and ſo much elegance of compoſition, that few will heſitate to give it the preference to any other of Sterne's imitators.

In 1781, he collected his poetical works in two vols. 12mo, and added ſeveral new pieces not before printed. The principal of theſe was " The Helvetiad," a fragment, written at Geneva in the year 1756. In the preface to this performance he gives the following account of it : " During a long ſtay I many years ſince made at Geneva, I viſited moſt of the principal places in Switzerland. The many ſublime ſcenes with which nature had enriched this romantic country ; the tranquillity and content with which every individual enjoys his property ; and, above all, that independence of mind which is ever the reſult of liberty—animated me with ſuch veneration for the firſt authors of that freedom, whoſe figures are recorded to poſterity either by ſculpture or painting in the public parts of the towns thro' thoſe little ſtates, that my enthuſiaſm betrayed me into a deſign of writing a poem on this ſingular revolution ; the argument of which I had divided into *ten cantos*, beginning the work with the oppreſſions of the Houſe of Auſtria, and cloſing it with the battle of Mongarten ; by which thoſe injured people finally renounced its uſurpation, and formed among themſelves thoſe various confederacies that ended in the great union and alliance of the preſent *thirteen cantons*. When I had ſettled the whole plan of this work, I occaſionally, as I found a diſpoſition in myſelf, took up any part of the poem which at the moment moſt invited my thoughts ; and enjoying at this time ſuch an intercourſe with M. de Voltaire as afforded me a conſtant acceſs to him, I acquainted him with my intention, ſhewing him the argument I had drawn out for the conduct of the whole deſign. He kept it a few days ; and, in returning it, told me, that he thought the great object of the piece, the epiſodes connected with the hiſtory, together with the ſcenery of the country, preſented ſubject matter whereon to form a fine poem ; " but the time (added he) which ſuch an undertaking will require, I would rather counſel you to employ on ſubjects that might more engage the public attention ; for ſhould you devote yourſelf to the completion of your preſent deſign, the Swiſs would be much obliged to you, without being able to read you, and the reſt of the world care little about the matter." Feeling the force and juſtneſs of the remark, Mr Keate laid aſide his plan, and probably never reſumed it. In the ſame year, 1781, he publiſhed " An Epiſtle to Angelica Kauffman."

A few years after, he became engaged in a long and vexatious law-ſuit, in conſequence of the neglect (to ſay the leaſt of it) of an architect who profeſſed himſelf to be his friend ; the particulars of which it is of no importance to detail. At the concluſion of the buſineſs, he ſhewed that his good humour had not forſaken him : And in 1787 he gave to the public the principal circumſtances of his caſe in a performance, intitled, " The Diſtreſſed Poet, a ſerio-comic Poem, in three Cantos," 4to, with ſome pleaſantry, and without any acrimony.

His laſt work did infinite honour to his head and his heart, as well as to the liberality of the bookſeller for whom on the title-page it was ſaid to be publiſhed. In the year 1782, the Antelope packet was ſhipwrecked on the Pelew iſlands, where the commander, Captain Wilſon, and his crew lived ſome time before they could get off. On his return to England, the Captain was, for ſome reaſon or other, refuſed the command of another ſhip ; and, as we have been informed, he was reduced to a ſtate much the reverſe of affluence. Theſe circumſtances being communicated to Mr Keate, who was ſtruck with admiration of the manners of the inhabitants of the Pelew iſlands (See Pelew Islands, *Encycl.*), he offered to draw up, for the benefit of Captain Wilſon, a narrative of the occurrences which took place during that officer's reſidence among ſo ſingular a people. This he executed in " An Account of the Pelew Iſlands, ſituated in the Weſtern Part of the Pacific Ocean : compoſed from the Journals and Communications of Captain Henry Wilſon and ſome of his Officers, who in Auguſt 1783 were there ſhipwrecked, in the Antelope, a Packet belonging to the Honourable the Eaſt India Company," 4to ; a work written with great elegance, compiled with much care, and which, if embelliſhed (as it has been inſinuated) with facts better calculated to have found a place in a novel than a genuine narrative, muſt be aſcribed to the miſinformation of thoſe who were actors in the ſcene, and muſt firſt have deceived before they obtained credit. We mention this report as it has come to us, without any attempt either to eſtabliſh or refute it. We ſhall only add, that if the charge is well founded, Mr Keate (who undertook the taſk on the moſt diſintereſted principle, and derived no advantage whatever from the work) was too ſturdy a moraliſt to have had any hand in the impoſition.—The manuſcript was offered to Mr Dodſley for 300 guineas; but he heſitated to give for it ſo large a price, when another bookſeller undertook to publiſh the work for the benefit of Mr Wilſon; and, we have reaſon to believe, paid to that gentleman, within the compaſs of a year, triple the ſum for which the manuſcript had been offered to Dodſley. Such conduct reflects honour on the London trade.

Beſides the pieces already mentioned, Mr Keate was the author of many Prologues and Epilogues, ſpoken at Mr Newcomb's ſchool at Hackney. He adapted his friend Voltaire's "Semiramis" to the ſtage; but this was ſuperſeded in 1777 at Drury Lane, by a worthleſs tranſlation of as worthleſs an author, one Captain Ayſcough; but neither this nor the author are deſerving of any further notice.

We ſhall conclude by obſerving, that Mr Keate's life paſſed without any viciſſitudes of fortune; he inherited an ample eſtate, which he did not attempt to increaſe otherwiſe than by thoſe attentions which prudence dictated in the management of it. He was hoſpitable and beneficent, and poſſeſſed the good-will of mankind in a very eminent degree. For the laſt year or two, his health viſibly declined; but on the day he died, it appeared to be ſomewhat mended. His death was ſudden, on the 27th of June 1797. He left one daughter, married in 1796 to John Henderſon, Eſq; of the Adelphi. At the time of his death, Mr Keate was a Bencher of the Temple, and a very old member of the Royal and Antiquary Societies, of both of which he had been frequently elected one of the council.

KEENE, a poſt-town of New-Hampſhire, and one of the moſt flouriſhing in Cheſhire county. It was incorporated in 1753, and contained in 1775, 756 and in 1790, 1,314 inhabitants. It is 14 miles from Walpole, 96 weſt of Portſmouth, and 86 N. W. from Boſton. N. lat. 42° 53'.—*Morſe.*

KELLYSBURGH, a townſhip in Chittenden county, Vermont, at the head of the north branch of La Moille river.—*ib.*

KENAPACOMAQUA, an Indian village on the north bank of Eel river, a branch of the Wabaſh.—*ib.*

KENDRICK's *Iſland* forms the weſt ſide of Nootka Sound, into which you may enter from the weſt by Maſſachuſetts Sound, along the northern ſide of the iſland.—*ib.*

KENNEBECK, next to Penobſcot is the fineſt river in the Diſtrict of Maine. Three miles from the Chops, Swan Iſland, 7 miles long, divides the waters of the river. The waters on both ſides of it are navigable; but the channel on the eaſt ſide of it is moſtly uſed. Thirty-eight miles from the ſea is the iſland Nahunkeag, which ſignifies the land where eels are taken. Within 3 miles of this iſland, a ſmall river coming weſt from ponds which are in the town of Winthrop, runs into the Kennebeck, and is known by the name of Cobbeſeconte, called by the Indians Cobbiſſeconteag, which in their language ſignifies the place where ſturgeon are taken. Six miles further up the river we find the head of the navigable waters. This is a baſon 46 miles from the ſea, and very commodious for the anchoring of veſſels. On the eaſt bank of the ſmall fall which terminates the navigation of the Kennebeck, is Fort Weſtern, which was erected in the year 1752. From that fort to Taconnet Fall is 11 miles. This is a great fall of water, and on the bank of it, on the eaſtern ſide of the river, is Fort Halifax, erected in 1754, and ſituated on the point of land formed by the confluence of the Sebaſtacook with the Kennebeck, by which the latter is increaſed one-third in ſize. The Sebaſtacook comes from lakes nearly north from its mouth; and in its windings receives brooks and ſmall rivers, for the ſpace of 150 miles. Thirty miles above Fort Halifax, as the river runs, the ſtream called Sandy river flows into the Kennebeck, at the point where the ancient town of Norridgewock ſtood; 40 miles or more further up, the Kennebeck takes a ſouth-weſtward courſe. The Kennebeck turning again weſtward, receives the eaſtern branch 50 miles from Norridgewock. The main branch of the Kennebeck, winding into the wilderneſs, forms ſeveral carrying-places, one of which, called the Great carrying-place, is 5 miles acroſs, and the river's courſe gives a diſtance of 35 miles, for that which is gained by 5 on the dry land. At about 100 miles diſtance from the mouth of the eaſtern branch, the ſource of the main or weſtern branch of the Kennebeck is found extended a great diſtance along the ſide of the Chaudiere, which carries the waters from the high lands into the St Lawrence. There are no lakes, but a few ſmall ponds and moraſſes at the ſource of this branch. The carrying-place from boatable waters in it, to boatable waters in the river Chaudiere, is only 5 miles over. The eaſtern branch of the Kennebeck, which unites with the other above Norridgewock, iſſues from a body of waters which lie N. about 20 miles from the confluence of the two branches. Theſe waters are called Mooſe Pond or Mooſe Lake. The ſides of the lake are ſo crooked, that the body of waters has an irregular figure; but the lake contains three times as much water as is found in Lake George. There are very high mountains to the north and weſt of the lake, and from theſe the waters run by many channels to the St Lawrence. The Kennebeck affords great quantities of lumber, and is inhabited at different ſeaſons by ſeveral ſpecies of valuable fiſh. Salmon and ſturgeon are taken here in great abundance, and ſhad and alewives relieve the wants of the neceſſitous part of the inhabitants. This river forms the neareſt ſea-port for the people on the upper part of the river Connecticut. From the Upper Cohos, or Coos, on the latter river to the tide-water in Kennebeck is 90 meaſured miles.—*ib.*

KENNEBUNK, the Indian name of the place ſince called *Wells*, Diſtrict of Maine, about 33 miles below Portſmouth, New-Hampſhire.—*ib.*

KENNET, a townſhip in Cheſter county, Pennſylvania.—*ib.*

KENNICOTT (Dr Benjamin) was a man of ſuch

Kennicott.

eminence in the learned world, that every thing relating to him muſt be generally intereſting. In the biographical ſketch of him publiſhed in the *Encyclopædia*, we have acknowledged ourſelves unacquainted with the rank and character of his parents; but this information has been ſince ſupplied by a very candid and well-informed writer in the Monthly Magazine; and as it is accompanied with circumſtances peculiarly honourable to the Doctor, and ought therefore to be preſerved, we ſhall inſert it in this place.

“ The parents of Dr Kennicott (ſays this writer) were honeſt characters: His father was the pariſh clerk of Totneſs, and once maſter of a charity ſchool in that town. At an early age young Kennicott ſucceeded to the ſame employ in the ſchool, being recommended to it by his remarkable ſobriety and premature knowledge. It was in that ſituation he wrote the verſes to the honourable Mrs Courtney, which recommended him to her notice, and that of many neighbouring gentlemen. They, with a laudable generoſity, opened a ſubſcription to ſend him to Oxford.

“ He ſoon there diſtinguiſhed himſelf, as is well known. As a teſtimony of the truth of the above ſtatement, the following is a copy of an inſcription written by Dr Kennicott, and engraved on the tomb of his father and mother. The writer of this article has tranſcribed it from the original in the church-yard of Totneſs. The tomb is more elegant than perſons in their ſituation are accuſtomed to have erected, and was thought, perhaps, by the envious to be ſomewhat oſtentatious. A perſonal knowledge of the Doctor induces the writer of this article to think, that it was rather the tribute of a good and grateful mind, and of the pious reverence and love which he entertained for the authors of his being.

As Virtue ſhould be of good report,
ſacred
be this humble Monument
to the Memory of
Benjamin Kennicott, Pariſh Clerk of Totneſs,
and Elizabeth his Wife:
The latter
an Example of every Chriſtian Duty;
The former,
animated with the warmeſt Zeal,
regulated by the beſt good ſenſe,
and both conſtantly exerted
for the Salvation of himſelf and others.
Reader!
Soon ſhalt thou die alſo;
and as a Candidate for Immortality
ſtrike thy breaſt and ſay,
Let me live the life of the Righteous,
that my laſt end may be like his.
Trifling are the dates of Time
where the ſubject is Eternity.
Erected
by their Son, B. Kennicott, D. D.
Canon of Chriſt-Church, Oxford.

“ It is ſaid, that when Dr Kennicott had taken orders, he came to officiate in his clerical capacity in his native town. When his father as clerk proceeded to place the ſurplice on his ſhoulders, a ſtruggle enſued between the modeſty of the ſon and the honeſt pride of the parent, who inſiſted on paying that reſpect to his ſon which he had been accuſtomed to ſhew to other clergymen: to this filial obedience was obliged to ſubmit. A circumſtance is added, that his mother had often declared ſhe ſhould never be able to ſupport the joy of hearing her ſon preach; and that on her attendance at the church for the firſt time, ſhe was ſo overcome as to be taken out in a ſtate of temporary inſenſibility.”

Kennomick,
||
Kermes.

KENNOMICK, GREAT, a navigable river of the N. W. Territory, emptying into the ſouth end of Lake Michigan, about N. lat. 42° 11′. The waters of this river communicate, by a portage of 30 yards, with Little Kennomick, a ſhort river which runs north-eaſterly into the lake.—*Morſe.*

KENSINGTON, a townſhip in Rockingham county, New-Hampſhire, about 6 miles ſoutherly of Exeter, and 8 northerly of Newbury-Port. It was incorporated in 1737. In 1775, it contained 797, and in 1790, 800 inhabitants.—*ib.*

KENT, a county of Maryland on the eaſtern ſhore of Cheſapeak Bay, bounded E. by New-Caſtle, and part of Kent county, Delaware, and W. by Cheſapeak Bay. It is about 32 miles long and 13 broad and contains 12,836 inhabitants, including 5,433 ſlaves. Chief town, Cheſter.—*ib.*

Kent, a county of Rhode-Iſland, lying S. of Providence county, on the W. ſide of Narraganſet Bay. It is 20 miles in length, and 10 in breadth, and is divided into four townſhips. It contains 8,785 inhabitants, including 63 ſlaves.—*ib.*

Kent, the middle of the three counties of Delaware. It is 40 miles from north to ſouth, and 26 from eaſt to weſt, and contains 18,920 inhabitants, including 2,300 ſlaves. The lands in Kent county are eſteemed the richeſt in the State. It is well watered by ſeveral ſmall ſtreams that empty into the Delaware. Chief town, Dover.—*ib.*

Kent, an iſland in Queen Ann's county, Maryland, and the largeſt in Cheſapeak Bay. It is 12 miles from north to ſouth, and 6 in breadth.—*ib.*

Kent, a townſhip in Litchfield county, Connecticut, bordering on the State of New-York, and 8 or 10 miles weſt of Litchfield.—*ib.*

KEOWE, anciently a populous town and territory of the Cherokee Indians, on the river of that name, the north-eaſternmoſt branch of Savannah river. The ſoil is very fertile, and the adjacent heights might, with little expenſe, be rendered almoſt impregnable. The fruitful vale of Keowe is 7 or 8 miles in extent, when a high ridge of hills terminates the vale, but opens again below the ridge, and continues 10 or 12 miles down to Sinica, and in width 1 or 2 miles. This was formerly one continued and thickly inhabited ſettlement, well cultivated and planted. It now exhibits a very different ſpectacle to the feeble remains of the once potent Cherokees. Fort George formerly ſtood near the old ſcite of Keowe.—*ib.*

KEPLERS, a village in Berks county, Pennſylvania, on Little Schuylkill river, the N. branch of Schuylkill river; 21 miles N. N. W. of Reading, and 32 W. of Bethlehem.—*ib.*

KERMES (ſee *Coccus Ilicis*, Encycl.) has been proved by Profeſſor Beckmann to have been uſed as a dye from very remote antiquity. “ All the ancient Greek and Latin writers, he ſays, agree, that kermes, called by the latter *coccum*, perhaps alſo *coccus*, and often *granum*, were found upon a low ſhrubby tree, with prickly leaves, which produced acorns, and belonged to the genus of the oak; and there is no reaſon to doubt that they mean *coccum ilicis*, and that low ever green oak, with the prickly leaves of the holly (*aquifolium*), which is called at preſent in botany *quercus ilex*. This aſſertion appears more intitled to credit, as the ancients aſſign for the native country of this tree places where it it is ſtill indigenous, and produces kermes.

"I am inclined (continues our author) to believe, that the art of employing kermes to dye a beautiful red colour was diſcovered in the Eaſt at a very early period; that it was ſoon ſo much improved as to excel even the Tyrian purple; and that it contributed to cauſe the proper purple to be at length abandoned. From the coſtly red dyes extolled ſo much by the Hebrew writers, and which, according to the opinion of learned commentators, were made from kermes, I ſhall not venture to adduce any proofs, as I am not acquainted with the Oriental languages to examine their accounts with accuracy; but I have found a paſſage in Vopiſcus, which ſeems to render my conjecture very probable. That author informs us, that the king of Perſia ſent to the Emperor Aurelian, beſides other articles of great value, ſome woollen cloth, which was of a much coſtlier and brighter purple colour than any that had been ever ſeen in the Roman empire, and, in compariſon of which, all the other purple cloth worn by the Emperor and the ladies of the court appeared dull and faded. In my opinion, this cloth, which was of a beautiful purple red colour, was not dyed with the liquor of the murex, but with kermes. This idea was indeed not likely to occur to the Romans, who were acquainted only with the purple of the murex, and who had leſs experience in the arts in general than in that of robbing and plundering, or who, at any rate, in that reſpect were inferior to the Orientals. The Roman emperors cauſed this ſuppoſed purple to be ſought for in India by the moſt experienced dyers; who, not being able to find it, returned with a vague report that the admired Perſian purple was produced by the plant ſandix. I am well aware, that ſome commentators have ſuppoſed that the ſandix was our madder. Heſychius, however, ſays, very confidently, that the *ſandix* is not a plant, but a kind of ſhrubby tree, which yields a dye like the *coccus*. The Roman dyers, perhaps prejudiced in favour of the murex, made that only the object of their ſearch; and their labour proving fruitleſs, they might have heard ſomething of kermes, or the kermes-oak, which they did not fully underſtand. Our dyers, even at preſent, believe many falſe accounts reſpecting the dye-ſtuffs which they uſe daily."

The uſe of kermes in dyeing ſeems to have been continued through every century. In the middle ages, as they are called, we meet with kermes under the name of *vermiculus* or *vermiculum*; and on that account cloth dyed with them was called *vermiculata*. Hence the French word *vermeil*, and its derivative *vermilion*, as is well known, had their extraction; the latter of which originally ſignified the red dye of kermes, but it is now uſed for any red paint, and alſo for fine pounded cinnabar.

KERSHAW, a county of Camden diſtrict, S. Carolina, on Wateree river, which ſeparates it from Richland county. It is 35 miles in length and 30 in breadth. —*Morse*.

KHAS, in Bengal, lands taken into the hands of government, oppoſed to the management of Zemindars or farmers. See ZEMINDAR in this *Supplement*.

KHALSA, in Bengal, ſometimes with the addition of *Shereeſah*, the department of land and revenues; the exchequer.

KHERAJE, in Bengal, ſignifies ſtrictly the tribute paid by a conquered country: it is alſo uſed for revenue in general.

KHIDMUT, office, attendance, employment, ſervice.

KHIDMUTGAR, a waiting man.

KHISMUT, portion or diviſion.

KHOMAR, or COMAR, a Zemindar's demeſne land.

KICKAPOUS, an Indian nation whoſe different tribes inhabit near the entrance of Lake Superior, where 20 years ago they had 400 warriors; part reſide at Lake Michigan, and between that and the Miſſiſſippi, near the Outtagomies, &c. and another tribe near the Piankeſhaws, and on the Wabaſh and its branches.

The Kickapous and Kaſkaſkias, two Indian nations lately hoſtile, ceded lands to the United States at the treaty of Greeneville, Auguſt 3, 1795. The United States, on the other hand paid them a ſum of money in hand, and engaged to pay them in goods, annually, to the value of 500 dollars forever.—*Morse*.

KICKEMUIT *River* is a N. weſtern arm of Mount Hope Bay. It is about 2 miles long, and half a mile broad. The town of Warren, in Briſtol county, in the State of Rhode-Iſland, lies N. W. of it.—*ib*.

KILLINGLY, a town in Windham county, Connecticut, in the north-eaſtern part of the State, bordering on Rhode-Iſland, and ſeparated from Pomfret by Quinebaug river. It lies about 18 miles eaſtward of Windham, and has a Congregational church. The original ſettlers were from Maſſachuſetts. The town was incorporated in May, 1708. In 1728 it was divided into two pariſhes; one of which is now incorporated by the name of Thompſon.—*ib*.

KILLINGTON, a mountainous townſhip in Rutland county, Vermont, having Medway on the W. Barnard N. E. and Saltaſh on the S. E. and contains 32 inhabitants. Waterquechee river has its ſource in a pond in this town.—*ib*.

KILLINGWORTH, a poſt-town in Middleſex county, Connecticut, ſituated on Long-Iſland Sound, 9 miles E. of Guilford and 27 W. of New-London. The Indian name of the townſhip was Hammonaſſet; and a ſtream of that name runs on the W. ſide of the town and divides it from Guilford. It was ſettled in 1663, by 12 planters from Hartford, Guilford, and Windſor. The Engliſh name deſigned to have been given this town was *Kennelworth*, but by miſtake it was recorded *Killingworth*. It was incorporated in 1703.—*ib*.

KILLISTINOES, Indians who inhabit on Lake Superior; and can furniſh 250 warriors.—*ib*.

KIMBECK, a place on the eaſt bank of Hudſon's river; 17 or 18 miles north of Poughkeepſie.—*ib*.

KINDERHOOK, a poſt-town in Columbia county, New-York, on the eaſt ſide of Hudſon's river; 13 miles north of Hudſon city, 29 S. by E. of Albany, 145 north of New-York, and 25 W. by N. of Stockbridge in Maſſachuſetts. The townſhip contains 4,661 inhabitants; of whom 411 are electors, and 638 ſlaves.—*ib.*

Kinderhook *Landing*, in the above townſhip, is ſituated under the bank of the river, ſurrounded with an uncleared barren country, has about 15 or 20 houſes, and nearly as many ſtores and other buildings; 20 miles S. of Albany. The town, through which the ſtage to New-York runs is about 5 miles eaſt of the Landing.—*ib.*

KING-Post, or King-*Piece*, is a piece of timber ſet upright in the middle, between two principal rafters, and having ſtruts or braces going from it to the middle of each rafter. See Roof, *Encycl.*; and Carpentry, *Suppl.*

KINGSESS, a townſhip in Philadelphia county, Pennſylvania.—*Morse.*

KING AND QUEEN, a county of Virginia, on Mattapany river, which ſeparates it from King William's county. It is about 25 miles long and 20 broad, and contains 9,377 inhabitants, including 5,143 ſlaves.—*ib.*

KING GEORGE, an ancient fort on the borders of Eaſt-Florida, near St Mary's river.—*ib.*

King George, a county of Virginia, lying between the Patowmac, and Rappahannock rivers. It is 22 miles long, and 14 broad, and contains 7,366 inhabitants of whom 4,157 are ſlaves.—*ib.*

KINGS, a maritime county of New-York, "containing all that part of the State, bounded eaſterly by Queen's county; northerly, by New-York county; weſterly, partly by Hudſon's river, partly by the ocean; and ſoutherly by the Atlantic Ocean, including Coney Iſlands." This fertile tract of land, ſituated on the W. end of Long-Iſland, and ſeparated from Staten-Iſland by the Narrows, contributes largely to the ſupply of the New-York market with vegetables, roots, fruits, butter, &c. It is divided into 6 townſhips, and contains 4,495 inhabitants, including 1,432 ſlaves. Chief towns, Brooklyn and Flatbuſh.—*ib.*

King's, a county of Nova-Scotia, comprehending the lands on the S. W. and S. ſides of the Baſin of Minas. The Habitant is navigable for veſſels of 40 tons a little way up. The Canaid for veſſels of 160 tons, 4 or 5 miles; and the Cornwallis is navigable for veſſels of 100 tons 5 miles, for thoſe of 50 tons 10 miles farther. There are conſiderable ſettlements on theſe rivers, and they afford a good portion of fine lands for tillage, and for herbage, and ſome excellent meadows. In the rivers are found a great abundance of ſhad of an excellent kind; and in the Baſin of Minas are fine cod-fiſh, haddock, baſs, and flat-fiſh of different kinds.—*ib.*

King's Bridge, a poſt-town of New-York, 15 miles north of New-York city, and 29 ſouth-weſt of Stamford in Connecticut. The bridge here connects New-York iſland with the main land. It was ſtrongly fortified during the war. The heights about it are commanding.—*ib.*

KINGSBURY, a townſhip in Waſhington county, New-York, bounded eaſterly by the tract of land called the Provincial Patent. It contains 1120 inhabitants.—*ib.*

KING'S, or PEARL ISLAND, a ſmall iſland in the Bay of Panama. It belongs to Spain, and is famous for its pearl fiſhery; and lies in N. lat. 7° 12′, W. long. 81° 36′.—*ib.*

KINGSTON, or ESOPUS, a poſt-town of New-York, ſituated in Ulſter county, on the W. ſide of Hudſon's river, ſix miles W. of Rhinebeck, and on the E. ſide of Eſopus Kill, or Creek. It was deſtroyed on the 15th of October, 1777, by order of General Vaughan, commanding a fleet which ſailed up the Hudſon, when large quantities of ſtores were conſumed. It is rebuilt on a regular plan, and contains about 150 houſes, a court-houſe, jail, a Dutch Reformed church, and an academy. It is moſt pleaſantly ſituated upon and ſurrounded by a ſpacious plain. It is 56 miles S. of Albany, and 109 N. of New-York. N. lat. 41° 56′, W. long. 73° 56′. The townſhip contains 3929 inhabitants, of whom 556 are electors, and 302 ſlaves.—*ib.*

Kingston, a townſhip in Addiſon county, Vermont, containing 101 inhabitants.—*ib.*

Kingston, a townſhip in Plymouth county, Maſſachuſetts, on the weſtern part of Plymouth Bay, bounded northerly by Duxborough, and contains 1004 inhabitants. There is here a ſlitting and rolling mill. The town was incorporated in 1707. It is 38 miles S. E. of Boſton.—*ib.*

Kingston, a townſhip in Rockingham county, New-Hampſhire, lying on the road which leads from Exeter to Haverhill, in Maſſachuſetts, 6 miles from the former, and 12 from Haverhill. It was incorporated in 1694. In 1775 it contained 961 inhabitants; and in 1790, 906.—*ib.*

Kingston, a village in New-Jerſey, three miles N. E. of Princeton, and 15 S. W. of Brunſwick; an elevated and pleaſant ſpot.—*ib.*

Kingston, the chief town of Lenoir county, Newbern diſtrict, N. Carolina. It is a poſt-town, ſituated in a beautiful plain on the N. ſide of Neus river, and contains a court-houſe, jail, and about 30 houſes. It is 40 miles W. of Newbern, and 24 from Wayneſborough.—*ib.*

Kingston, a townſhip in Luzerne county, Pennſylvania.—*ib.*

Kingston, a town of Georgetown diſtrict, S. Carolina. It is ſituated on the W. ſide of Wakkamau river, and contains an Epiſcopal church, and about 30 houſes. It is 41 miles N. by E. of Georgetown, and 103 N. N. E. of Charleſton. N. lat. 33° 51′, W. long. 79° 1′.—*ib.*

Kingston, a village in Talbot county, Maryland, ſituated on the eaſtern ſide of Choptank river, 4 miles below the Forks.—*ib.*

Kingston, formerly called *Frontinac*, is ſituated on the northern part of Lake Ontario, at the mouth of its outlet Iroquois river; 200 miles ſouthward of Montreal, and 150 northward of Niagara. Here the King's ſtores are kept and guarded by one company of men. Part of Old Fort Frontinac is now ſtanding, the beſt part of which is the magazine. Kingſton contains about 100 houſes. Large veſſels go no farther than this place; thence to Niagara, &c. ſtores and merchandize are conveyed in boats.—*ib.*

Kingston, the capital of the iſland of St Vincents, in the Weſt-Indies, and the ſeat of government, lies at the head of a bay of the ſame name, on the ſouth-weſtern ſhore of the iſland, in St George's pariſh.—*ib.*

KING WILLIAM, a county of Virginia, between Mattapony and Pamunky rivers. It is 47 miles long and 15 broad, and contains 8,128 inhabitants; of whom 5,151 are ſlaves.—*ib.*

KINGWOOD, a townſhip in Huntingdon county, New-Jerſey, containing 2,446 inhabitants, including 104 ſlaves. It is about 5 miles below Alexandria, and 15 S. W. of Lebanon. Alſo the name of a ſmall river of New-Jerſey.—*ib.*

KINGSALE, a poſt-town of Virginia, 16 miles from Weſtmoreland court-houſe, and 12 from Northumberland court-houſe.—*ib.*

KIOANON POINT, called in ſome maps *Kikeionec*, is the extremity of a large peninſula which projects far into the ſouth ſide of Lake Superior.—*ib.*

KIONTONA, an Indian town on Conewango river, in Pennſylvania, and 11 miles northerly from its mouth in Alleghany river.—*ib.*

KIPPIS (Andrew, D. D. F. R. and A. S.), was born at Nottingham, March 28 (O. S.) 1725. His father, a reſpectable tradeſman of that town, was deſcended from the Rev. Benjamin King of Oakham, Rutlandſhire, an ejected miniſter; and his mother, Ann Ryther, was the grand daughter of the Rev. John Ryther, who was ejected from the church of Fernby, in the county of York. In the year 1730, he loſt his father, and went to reſide with his grandfather, Andrew Kippis of Seaford in Lincolnſhire. He received his claſſical education at the grammar ſchool in that town; but what contributed moſt to his future eminence, was the friendſhip of the Rev. Mr Merrival, who was equalled by few of his contemporaries in various branches of learning, particularly in his acquaintance with the claſſics, his knowledge of ancient and modern hiſtory, and his refined taſte in the belles lettres. Dr Kippis frequently ſaid, that it was impoſſible for him to expreſs his obligations to this friend of his youth. In 1741 he removed to Northampton, and commenced his academical ſtudies under Dr Doddridge. After a reſidence of five years at the academy, he was invited by ſeveral congregations to become their miniſter. Though he was preſſed to ſettle at Dorcheſter, and had been choſen their miniſter, he gave the preference to an invitation from Boſton in Lincolnſhire, where he went to reſide in September 1746. Here he continued four years; and in November 1750, accepted the paſtoral charge of a congregation at Dorking in Surry. The congregation meeting in Princes-ſtreet Weſtminſter, having been without a miniſter about two years, he was choſen, in June 1753, to ſucceed the Rev. Dr Obadiah Hughes. On the 21ſt of September following, he married, at Boſton, Miſs Elizabeth Bott, one of the daughters of Mr Iſaac Bott, a merchant of that place; and in the month of October fixed his reſidence in Weſtminſter. In June 1767, he received the degree of D. D. from the univerſity of Edinburgh, on the unſolicited recommendation of the late learned Profeſſor Robertſon. He was elected a member of the Society of Antiquaries on the 19th of March 1778; and on the 17th of June 1779, he was choſen a Fellow of the Royal Society. In both Societies he had the honour of being in the council two years.

Dr Kippis was eminently diſtinguiſhed for the virtues and accompliſhments which form the chief ornaments of private life. With a ſuavity of manners and urbanity of behaviour peculiarly attractive, he united that knowledge of men and books which rendered his converſation uncommonly entertaining and inſtructive to the circle of his acquaintance and friends. As a miniſter, he was not leſs eminent for his profound acquaintance with every branch of theology than for the happy manner in which he applied it to the improvement of thoſe who attended his miniſtry. His ſermons were remarkable for perſpicuity, elegance, and energy; and his elocution was unaffected and very impreſſive, particularly at the cloſe of his diſcourſes. But the ſuperior powers and vigour of mind which he derived from nature, and which he had cultivated with unremitting diligence and peculiar ſucceſs, were not to be confined to the narrow limits of private life and the duties of the paſtoral charge, however important; they were deſigned for more extenſive and important ſervices to his country and to mankind. The intereſts of literature, ſcience, and religion, have received from the exertion of his talents as a writer the moſt eſſential advantages. His firſt efforts in literature were made in the Gentleman's Magazine, a periodical publication called the Library, and the Monthly Review; to each of which he contributed many important articles, eſpecially in the hiſtorical and philological departments of the laſt. He was the author of three important tracts, viz. "A Vindication of the Proteſtant Diſſenting Miniſters, &c." "Obſervations on the late Conteſts in the Royal Society;" and "Conſiderations on the Treaty with America, &c." His improved edition of Dr Doddridge's Lectures is a work of great value; and "the Hiſtory of Knowledge, Learning, and Taſte, in Great Britain," prefixed to the New Annual Regiſter, merits, and has received, the approbation of the public. He publiſhed at different times ſeveral ſingle ſermons; among which, that on the death of his friend the Rev. Mr Laugher, is intitled to very high praiſe. The greater part of theſe he republiſhed, with other practical diſcourſes, in the year 1794: but the work which, next to the ſtudies immediately connected with his office as a Chriſtian miniſter, engaged his principal attention, and by which he has long been diſtinguiſhed, is, the improved edition of the "*Biographia Britannica.*" In this great national publication, the comprehenſiveneſs and powers of his mind, the correctneſs of his judgment, the vaſt extent of his information, his indefatigable reſearches and unremitting aſſiduity, his peculiar talent of appreciating the merits, and analyzing the labours of the moſt eminent writers, and his unſhaken integrity, unbiaſſed fidelity, and impartial deciſion on the characters of the philoſopher, ſtateſman, poet, ſcholar, and divine, are ſtrongly diſplayed, and univerſally acknowledged. His ſtyle, formed on the models of Sir William Temple and the claſſical Addiſon, is remarkable for its perſpicuity, elegance, and purity; and gives a peculiar luſtre to the rich ſtores of knowledge treaſured in the volumes now publiſhed. This work has given him a high rank among the literati of his country, and will carry down his name with diſtinguiſhed reputation to poſterity. He died on the 8th October 1795.

KISHTAC, an iſland on the N. W. coaſt of North-America, lies eaſtward of Foggy Cape, on the ſouth-eaſt ſide of the peninſula of Alaſka, and on that part of it oppoſite the head of Briſtol Bay, on the N. W. ſide of the peninſula. It is alſo oppoſite the mouth of Cook's river.—*Morſe.*

KISKEMANITAS *River,* is a branch of Alleghany river, into which it empties in N. lat. 40° 40′, in Weſtmoreland county, Pennſylvania. Its head waters are Little Conemaugh and Stone creek. After their junction it is called Conemaugh river. It then receives Black Lick from the N. E. and 17 miles from its mouth Loyalhannon Creek enters from the S. S. E. after which it is called Kiſkemanitas river. It is navigable for batteaux 40 or 50 miles, and good portages are found between it and Juniatta and Potowmac rivers. Coal and ſalt are diſcovered in the vicinity of theſe rivers.—*ib.*

KITTANING, a ſettlement in Pennſylvania, on the eaſt ſide of Alleghany river, 36 miles northward of Pittſburg.—*ib.*

KITTATINNY *Mountains,* a ridge of the Alleghany Mountains, which runs through the northern parts of New-Jerſey and Pennſylvania.—*ib.*

KITTERY, a townſhip in York county, Diſtrict of Maine, incorporated in 1653, and conſiſts of 3 pariſhes, containing 3,250 inhabitants. It is ſituated between Piſcataqua and York rivers, 67 miles northerly of Boſton. In this town is Sturgeon Creek, called ſo from the plenty of that fiſh, in the mouth of the creek at the firſt ſettlement of the country; but there have been none found for theſe many years paſt. This creek is famous in the hiſtory of the firſt ſettlers.—*ib.*

KNOB LICK, in Mercer county, Kentucky, lies 15 miles S. E. of Harrodſtown, and about 12 ſoutherly of Danville.—*ib.*

KNOWLTON, a townſhip in Suſſex county, New-Jerſey, containing 1,937 inhabitants, of whom 13 are ſlaves.—*ib.*

KNOULTON, a grant in Chittenden county, Vermont, lies E. of Smithfield, and W. of Kellyſburgh, and contains 10,000 acres of land.—*ib.*

KNOX, a county in the State of Tenneſſee, in Hamilton diſtrict, contained in 1795, according to the State cenſus, 11,573 inhabitants, of whom 2,365 were ſlaves.—*ib.*

KNOX, a county in the N. W. Territory, erected June 20, 1790. "Beginning at the Standing Stone Forks of the Great Miami river, and down the ſaid river to its confluence with the Ohio river; thence with the Ohio to the ſmall rivulet above fort Maſſac; thence with the eaſtern boundary line of St Clair county, to the mouth of the little Michilimackinack; thence up the Illinois river to the forks or confluence of the Theakiki and Chikago; thence by a line to be drawn due north to the boundary line of the territory of the United States, and ſo far eaſterly upon ſaid boundary as that a due ſouth line may be drawn to the place of beginning." Alſo the name of a fort in the ſame territory.—*ib.*

KNOX, one of Ingraham's iſlands. Capt. Ingraham diſcovered two iſlands, which he called *Knox* and *Hancock,* which Capt. Roberts ſoon after diſcovering, called *Freeman* and *Langdon.* Theſe iſlands had every appearance of fertility. Their latitude is from 8° 3′, to 8° 5′ S. and their longitude very nearly 141° W. from Greenwich.—*ib.*

KNOXVILLE, the metropolis of the State of Tenneſſee, is ſituated in Knox county, on the north ſide of Holſton river, on a beautiful ſpot of ground, 22 miles above the junction of Holſton river with the Tenneſſee, and 4 below the mouth of French Broad river. It is in a flouriſhing ſituation, and enjoys a communication with every part of the United States by poſt. It is regularly laid out, and contains about 130 houſes, a court-houſe, gaol, and barracks large enough to contain 700 men. The ſupreme courts of law and equity for the diſtrict of Hamilton are held here half yearly, and the courts of pleas and quarter ſeſſions for Knox county are held here. A college has been eſtabliſhed here by government, called Blount College. It is 32 miles N. of Tellico Blockhouſe; 200 S. E. by S. of Frankfort, in Kentucky; 485 W. by S. of Richmond, in Virginia; and 728 ſouth-weſterly of Philadelphia.—*ib.*

KOL-QUALL, the Abyſſinian name of a tree, which ſome botaniſts have ſuppoſed to be the EUPHORBIA *Officinarum* of Linnæus. Mr Bruce, who gives the only deſcription of the Kol-quall that we have ſeen, is of a different opinion: for which he aſſigns two reaſons; the firſt is, that the flower, which he ſays is roſaceous, is compoſed of ſeveral petals, and is not campaniform; and the ſecond, that it produces no ſort of gum, either ſpontaneouſly or upon inciſion. We muſt acknowledge, that we entertain ſome doubts whether our author was at due pains to aſcertain this fact; and theſe doubts are ſuggeſted by his own hiſtory of the tree. His deſcription is not very perſpicuous, and therefore, leſt we ſhould miſrepreſent his meaning, we ſhall give it in his own words:

"The firſt thing that preſented itſelf was the firſt ſhoot of this extraordinary tree. It was a ſingle ſtalk, about ſix inches meaſured acroſs, in eight diviſions, regularly and beautifully ſcolloped and rounded at the top, joining in the centre at three feet and a half high. Upon the outſide of theſe ſcollops were a ſort of eyes or ſmall knots, out of every one of which came five horns, four on the ſides and one in the centre, ſcarce half an inch long, fragil, and of no reſiſtance, but exceedingly ſharp and pointed. Its next proceſs is to put out a branch from the firſt or ſecond ſcollop near the top, others ſucceed from all directions; and this ſtalk, which is ſoft and ſucculent, of the conſiſtence of the aloe, turns by degrees hard and ligneous, and after a few years, by multiplying its branches, aſſumes the form of a tree, the lower part of which is wood, the upper part, which is ſucculent, has no leaves; theſe are ſupplied by the fluted, ſcolloped, ſerrated, thorny ſides of its branches. Upon the upper extremity of theſe branches grow its flowers, which are of a golden colour, roſaceous, and formed of five round or almoſt oval petala; this is ſucceeded by a triangular fruit, firſt of a light green with a ſlight caſt of red, then turning to a deep crimſon, with ſtreaks of white both at top and bottom. In the inſide it is divided into three cells, with a ſeed in each of them; the cells are of a greeniſh white, the ſeed round, and with no degree of humidity or moiſture about it; yet the green leaves contain a quantity of bluiſh watery milk almoſt incredible.

"Upon cutting two of the fineſt branches of a tree in its full vigour, a quantity of this iſſued out, which I cannot compute to be leſs than four Engliſh gallons; and this was ſo exceedingly cauſtic, that though I waſhed the ſabre that cut it immediately, the ſtain has not yet left it.

" When the tree grows old, the branches wither, and, in place of milk, the inſide appears to be full of powder, which is ſo pungent, that the ſmall duſt which I drew upon ſtriking a withered branch, ſeemed to threaten to make me ſneeze to death, and the touching of the milk with my fingers excoriated them as if ſcalded with boiling water; yet I everywhere obſerved the wood-pecker piercing the rotten branches with its beak, and eating the inſects, without any impreſſion upon its olfactory nerves."

If what is milk in a young tree be a dry powder in one that is old, is it not probable that the milk might by evaporation be reduced to the conſiſtence of gum, and that the kol-quall may be at moſt but a variety of the *euphorbia officinarum*? From our author's obſervation, the kol-quall appeared to thrive beſt on poor, ſandy, ſtony earth, at no great diſtance from the ſea. The Abyſſinians employ the milky juice in tanning to take off the hair from the ſkins, and they make no other uſe whatever of the tree.

KOONA, a ſpecies of ECHITES (for which ſee *Encycl.*), very common in the woods of North Africa. It is a ſhrub, of which the leaves, when boiled with a ſmall quantity of water, yield a thick black juice, into which the negroes dip a cotton thread. This thread they faſten round the iron of their arrows, in ſuch a manner that it is almoſt impoſſible to extract the arrow when it has ſunk beyond the barbs, without leaving the iron and the poiſoned thread in the wound. The poiſon of the koona is ſaid to be very deadly.—*Park's Travels.*

KORAQUAS, a tribe of Hottentots inhabiting a diſtrict of South Africa, which M. Vaillant places on the confines of the Nimiqua country (See NIMIQUAS, *Suppl.*). When our author viſited them, the whole tribe was aſſembled for the election of a chief: and not agreeing among themſelves, ſome blood had been ſhed, and much more would have been ſhed, had they not unanimouſly made choice of him. When he firſt joined them, the whole horde paid attention to nothing but their quarrel. To ſee their warmth, one might have ſuppoſed that their election was a matter of importance to the whole world, and that the fate of mankind was about to depend on their chief. All ſpoke at the ſame time; each endeavoured to drown his neighbour's voice by his own; their eyes ſparkled with fury; and amidſt this confuſion, while they threatened each other in turns, the noiſe they made became truly dreadful.

Unarmed, and without any precaution, though ſurrounded by this enraged multitude, our author walked calmly along in the midſt of them; and when he reached the kraal, he ordered his tent to be immediately formed, as if he had been ſurrounded by friends and relations. This appearance, raiſed ſuddenly, and as if by magic, before the eyes of the horde, with his fuſees, horſes, and tent, objects which were all new to them, filled them with admiration. Men, women, and children, motionleſs, and with their mouths wide open, all ſtood looking at them with profound ſilence. Anger, hatred, and every violent paſſion, ſeemed by their countenances to be extinguiſhed, and to have given place to more tranquil emotions, to ignorant ſurpriſe, and ſtupid aſtoniſhment. Infancy is naturally curious; it is ſtruck with every thing it ſees; and the ſavage, in this reſpect, is only a grown-up child. As theſe ſavages ſeemed to wiſh that he would permit them to examine more cloſely whatever excited their admiration, he readily condeſcended to gratify their deſire. They approached, ſurveyed, and handled every thing. But the principal object of general curioſity was his perſon. They ſeemed as if they would never be ſatisfied with looking at his dreſs. They pulled off his hat, that they might the better examine his hair and his beard, which were long. They even half unbuttoned his clothes; and ſurpriſed to ſee his ſkin white, each felt it, as if deſirous to aſcertain that what they ſaw was real.

This comedy continued till the evening; and at length, when the moment of ſeparation arrived, M. Vaillant cauſed to be hinted to the whole company, that if, two hours after ſun-riſe next morning, they ſhould not be agreed reſpecting the choice of a chief, he would immediately leave them. He added, however, that if, on the other hand, they came and preſented to him a chief, elected by general conſent, he would then load them all with preſents, and beſtow on him a diſtinction which would raiſe him above all his equals, and render the horde one of the moſt celebrated in the whole country. " But what was my ſurpriſe (ſays he) when I learned the ſame evening, that on my head the burden of the crown was depoſed!" He acquieſced, however; aſſuring them, that if they would promiſe to be obedient, he would give them the only chief worthy of ruling them, and of making them happy.

By his interpreters he had learned, that the choice of the majority leaned towards one Haripa, a man about 40 years of age; tall, well made, exceedingly ſtrong, and conſequently formed by nature for ruling the feeble multitude. He therefore named Haripa chief; and the people appearing to approve of his choice, he commanded ſilence, and cauſing the new monarch to approach, placed on his head, with great ſolemnity, a Dutch grenadier cap, of which the copperplate on the front was ornamented with the arms of Holland. This ſymbol, *viz.* a lion rampant, having in one of his fore-paws ſeven arrows, and in the other a naked ſabre, could not fail to pleaſe the ſavages, as it exhibited a repreſentation of the weapons peculiar to them, and of the moſt formidable animal of their country. They teſtified their admiration in the moſt expreſſive manner; and imagined that, ſuperior to kings, the white man during the night had by magic made this crown, merely to adorn their chief, and to afford them pleaſure. Vaillant then affixed to the ſkin, which formed Haripa's dreſs, ſeveral rows of glaſs beads; gave him a girdle made of a ſtring of very large ones; ornamented his arms with tin bracelets, and ſuſpended from his neck a ſmall padlock, ſhaped like a butterfly, the key of which had been loſt. Such padlocks, made in the form of animals of every kind, are very common at the Cape. They come from China; and are brought to Africa by the captains of the Company's ſhips which trade in the Indian ſeas.

During the ceremony of inſtallation, the whole horde, dumb and motionleſs through admiration, ſeemed loſt in ecſtacy. Haripa himſelf, though highly gratified, did not dare to make the leaſt movement, and obſerved a gravity altogether riſible. When the inauguration was finiſhed, and he was completely dreſſed, our author preſented him with a mirror, that he might enjoy the ſatisfaction of ſurveying his own figure. He then ſhewed him to the people, who expreſſed their joy by ſhouts and applauſes without end.

"Ye honeſt hearts (ſays M. Vaillant), who peruſe this account, behold what it coſt me to reſtore peace among a whole tribe, and to prevent them from deſtroying each other!" From this moment concord was re-eſtabliſhed; univerſal joy prevailed through the horde; and they inſtantly began their dancings, which continued for three days and three nights without intermiſſion. They killed for this feſtival ſeveral fat ſheep, and even two oxen; an extraordinary and truly aſtoniſhing magnificence among a people who, when they barter one of their daughters for a cow, think they have made an excellent bargain.

Our author, wiſhing to purchaſe ſome oxen for his waggons, bought them at the price of a nail the ox; and thoſe who had the good fortune to make ſuch an exchange were highly ſatisfied with their bargain. Nails and ſmall bits of iron were indeed of real value to them, to point the arrows and aſſageys with which they ſhot the antelopes that abound in their country, and conſtitute much of their food. Like other ſavages, the Koraquas were ready to pilfer, and appropriate to their own uſe whatever they found pleaſing, or ſuited to their purpoſes. They attempted to carry away ſome of our author's effects, even before his face: and to prevent their rapacity, he was obliged either to watch over, or to depoſit them in ſome place of ſafety.

The Koraquas are much taller than the Hottentots of the colonies, though they appeared evidently to be deſcended from the ſame race, having the ſame language and cuſtoms with their neighbours the Nimiquas (ſee that article), who are certainly of Hottentot extraction.

As the exceſſive dryneſs of the country renders ſprings very rare, the Koraquas would be unable to inhabit it, had they not found the means of remedying this ſcarcity of water. For this purpoſe they dig in the earth a kind of ciſterns or rather wells, to which they deſcend gradually by ſteps; and theſe people are the only African nation among whom our author ever found the ſame mark of induſtry.

As their wells always contain little water, and as none is to be loſt, they take care to ſecure it even from the birds, by cloſing up the mouth of the hole with ſtones and the branches of trees; ſo that, unleſs one knows the ſpot, it is impoſſible to find it. They go down into it every day, to fetch up as much water as may be neceſſary for the conſumption of their people and cattle. They draw it in a kind of veſſels made of hollowed wood, and pour it into the ſkins of buffaloes or giraffes, placed in a concave form on the ground to hold it; but they diſtribute it with the utmoſt parſimony, and never draw more than they abſolutely have occaſion for.

Nothwithſtanding this ſtrict economy, the wells often become dry; and in that caſe the horde is obliged to remove to ſome other place. Among all the weſtern tribes, therefore, there are none who lead ſo wandering a life as the Koraquas: the conſequence of which is, that, as they often change their abode, and acquire new neighbours, they muſt, in ſome meaſure, adopt the cuſtoms of the nations near which they fix their reſidence. Some tribes of them greaſe themſelves like the Hottentots; while others tattoo their face, breaſt, and arms, after the manner of the Caffres. It is, however, to be remarked, that the ſame colour is not employed by all the Koraquas; each has his own, according as caprice may direct him in his choice, and it generally varies every day; which renders, as one may ſay, the inhabitants of the ſame horde ſtrangers to each other, and gives them a motley appearance, as if they were dreſſed for a maſquerade.

KORTRIGHT, a townſhip in Otſego county, New-York; 122 of its inhabitants are electors.—*Morſe.*

KRIS, Indians inhabiting the banks of Lake Chriſtineaux. They can raiſe 1,200 warriors.—*ib.*

KRISHNA or Crisna, is an eaſtern river of conſiderable magnitude, which is very little known in Europe. We have the following account of it, and its tributary waters, and the countries through which it flows, in Mr Pennant's View of Hinduſtan:

"From Gangapatam, on the northern mouth of the Pennar, the land runs due north as far as Mottapilli, when it forms a ſtrong curve toward the eaſt; the point of which is one ſide of the great river Criſna, in about lat. 15° 43′. Its Delta, which winds round as far as Maſulipatam, is not conſiderable. This river annually overflows a vaſt tract of country, like the Indus on the weſtern ſide of this empire, and like all the other great rivers on this extenſive coaſt. The Criſna riſes from the foot of the weſtern Ghauts, and not more than 45 miles from Severndrug, on the weſtern coaſt. There is another branch to the eaſt, that riſes ſtill more northerly. On that ſide is Sattara, a ſtrong fortreſs, the capital of the Mahratta ſtate in the time of the rajahs of Sivaji's race. It was taken by him in 1673, and found to be the depoſitory of immenſe treaſure; at that time it belonged to the king of Vijapur: it was afterwards uſed by the Mahrattas as the lodgment of their riches, and alſo as a retreat for the more defenceleſs inhabitants of Puna, and other open towns, in time of potent invaſions.

"The river continues deſcending to the eaſt. In latitude 17° is Meritch, a ſtrong fortreſs, with a Jaghirdar territory, conquered from its owner by Hyder. In lat. 16° 45′, a ſmall river diſcharges itſelf into the Criſna from the north. It would not be worth mentioning, but that Pannela, a fortreſs of vaſt ſtrength, was made by Sumbuji, the profligate ſon of Sivaji, his reſidence juſt before his ſurpriſal in 1689, betrayed by Cablis Khan, the vile inſtrument of his pleaſures, corrupted by Aurengzebe. His extravagant love of women brought on him ruin. Informed by Cablis that a Hindu of rank and great beauty was on the road to be delivered by her parents to her huſband, according to the cuſtom of the Hindus, he inſtantly put himſelf at the head of a ſmall body of horſe to carry off the prize, and ordered Cablis to follow at a diſtance for his protection, in caſe of accidents in that hoſtile time. The traitor had given notice to Aurengzebe of this expedition, who, ſending a body of cavalry, ſurpriſed Sumbuji juſt as he had diſperſed the nuptial proceſſion.

"Into the north ſide of the Criſna, in lat. 16° 20′, falls the great river Bima, after a courſe of 350 miles. It riſes at the head of the weſtern Ghauts, parallel to Chaul in the Concan, and not above 50 miles from the ſea. It deſcends rapidly towards the ſouth-eaſt. In lat. 17° 40′ it receives a ſmall river from the weſt, on the ſouthern banks

Kriſhna. banks of which ſtands Vijapur, the capital of the famous kingdom of the ſame name, now poſſeſſed by the Mahrattas, but once governed by its own monarchs, till conquered by Aurengzebe in 1686. It was of great extent, and reached to the weſtern ſea, where it poſſeſſed the ports of Dabul, Vingorla, and Carapatan.

"The capital Vijapur is ſome leagues in circuit, ſeated in a fine but naked country, well watered. It makes a ſingular appearance from an adjacent eminence, filled with numbers of ſmall domes, and one of a majeſtic ſize. It was once a city of great ſplendour, and filled with palaces, moſques, mauſoleums, and public and private buildings of great magnificence; many of them are fallen to ruin, and give melancholy proofs of its former ſplendour. I ſhall not attempt to detail them. The palaces of the kings, and accommodations for their attendants, were within a vaſt fort, ſurrounded with a ditch 100 yards wide; the depth appeared to be great, but is now filled with rubbiſh: within the fort is the citadel. Tavernier ſays, that the great ditch was filled with crocodiles, by way of garriſon, to prevent all acceſs by water. Lieutenant Moor has his doubts about this, imagining that there never was any water in this foſs. That ſuch garriſons have exiſted I doubt not. I have read in Purchas, that in Pegu the foſſes of fortified places were ſtocked with thoſe tremendous animals, not only to keep out enemies, but to prevent deſertion. This practice has certainly been of great antiquity in ſome parts of India: Pliny mentions it as uſed in a fair city of the Horatæ, a people I cannot trace.

"The Criſna, above and below its conflux with the Bima, is fordable; and a few miles below its channel is 600 yards wide, made horrid with the number and rudeneſs of the variouſly formed rocks, which are never covered but in the rainy ſeaſon.

"The Tungbuddra is another vaſt branch of the Criſna. It falls into it in lat. 16° 25′, and originates extremely ſouth, from a doubtful fountain. Towards its lower part it divides into three or four ſmall branches, which riſe remote from each other; the moſt ſouthern is the Curga Naïr's country; the moſt northern from the head of the Ghauts oppoſite to Onor, and ſcarcely 20 miles from the ſea. What muſt give this river great celebrity, is its having had on its banks, in lat. 15° 22′, the ſplendid city of Vijanagar. Feriſhta ſays, that it was founded in 1344 by Belaldeo king of the Carnatic, which in thoſe days included the whole peninſula. It was viſited by Cæſar Frederick a Venetian traveller, in 1565, and found deſerted and ruinous, having been ſacked by four confederated Mahomedan princes two years before, on which its monarch had retired to Penuconda. Frederick ſays that its circumference was 24 miles. Mr Rennel has given us a view of its preſent ſtate from Lieutenant Emitt, who viſited it in 1792.

"The ruins of Vijanagar are in the little Sircar of Anagundi, which does not extend above 20 miles around this vaſt city. It is very ſingular, that that little Sircar is now poſſeſſed by a lineal deſcendant of Rama Rajah, the laſt great monarch of Vijanagar, and its attendant nations Canarine and Malabar, united 700 years before under the rule of Criſna Deva. Tippu wiſhed to reſerve this little tract to himſelf, for the ſatisfaction of generouſly reſtoring to the deſcendant the ſmall relique of the great empire of his anceſtors. He is denied the title of Rajah, inſtead of which he has the diminutive Riil beſtowed on him. This is ſuitable to his revenues, which do not exceed two lacs of rupees, or 25,000 *per annum*, with the empty regality of a mint at Anagundi." In the remainder of its courſe the Criſna offers nothing remarkable. Kuara, || Kumi.

KUARA, is a beautiful tree, which grows in the ſouth and ſouth-weſt parts of Abyſſinia. With the ebony it is almoſt the only wood of the province of Kuara, of which it bears the name; but Mr Bruce aſſures us, that it is very frequent in all the countries where there is gold. "It is (ſays he) what naturaliſts call *a Corallodendron*, probably from the colour of its flowers or of its fruit, both equal in colour to coral. Its fruit is a red bean, with a black ſpot in the middle of it, which is incloſed in a round capſula or covering, of a woody nature, very tough and hard. This bean ſeems to have been in the earlieſt ages uſed for a weight of gold among the Shangalla, and, where that metal is found, all over Africa; and by repeated experiments, I have found that, from the time of its being gathered, it varies very little in weight, and may perhaps have been the very beſt choice that therefore could have been made between the collectors and buyers of gold.

"I have ſaid this tree is called kuara, which ſignifies the ſun. The bean is called *carat*, from which is derived the manner of eſteeming gold as ſo many carats fine. From the gold country in Africa it paſſed to India, and there came to be the weight of precious ſtones, eſpecially diamonds; ſo that to this day in India we hear it commonly ſpoken of gold or diamonds, that they are of ſo many carats fine or weight. I have ſeen theſe beans likewiſe from the Weſt-Indian iſlands. They are juſt the ſame ſize, but, as far as I know, are not yet applied to any uſe there."

This is a very different account of the origin of the term Carat from what we have given in the *Encyclopædia*; but the reader will judge for himſelf between the two.

KULSAGE, or *Sugar Town*, a little Cherokee town in the vale of Keowe.—*Morse*.

KUMI, the name of an iſland between Japan and China, of which Perouſe writes in the following terms: "On the 5th of May, at one o'clock in the morning, we made an iſland, which bore north north eaſt of us; we paſſed the reſt of the night, ſtanding off and on, under an eaſy ſail, and at day-break I ſhaped my courſe ſo as to run along the weſt coaſt of this iſland, at the diſtance of half a league. We ſounded ſeveral times without finding bottom. We were ſoon ſatisfied that this iſland was inhabited, for we ſaw fires in ſeveral places, and herds of oxen grazing on the ſea-ſhore. When we had doubled its weſt point, which is the moſt beautiful and beſt inhabited ſide, ſeveral canoes put off from the ſhore in order to obſerve us. They ſeemed to be extremely in fear of us; their curioſity cauſed them to advance within muſket ſhot, and their diſtruſt made them immediately flee away with ſpeed. Our ſhouts, geſtures, ſigns of peace, and the ſight of ſome ſtuffs, at length determined two of the canoes to come alongſide of us. I made each of them a preſent of a piece of nankeen and ſome medals. It was evident that theſe iſlanders had not left the coaſt with any intention of trafficking with us, for they had nothing to offer in exchange for our preſents; they only faſtened to a rope

Kumi.

a bucket of freſh water, making ſigns to us, that they ſtill thought themſelves in our debt, but that they were going aſhore to fetch proviſion, which they expreſſed by putting their hand into their mouth. Before coming alongſide the frigate, they placed their hands upon their breaſt, and raiſed their arms towards the ſky: theſe geſtures were repeated by us, and then they reſolved to come on board; but it was with a want of confidence, which was ſtrongly expreſſed in their countenance during the whole time. They nevertheleſs invited us to approach the land, giving us to underſtand, that we ſhould there want for nothing. Theſe iſlanders are neither Japaneſe nor Chineſe, but, ſituate between theſe two empires, they ſeem to partake of both people. Their covering was a ſhirt and a pair of cotton drawers. Their hair, tucked up on the crown of the head, was rolled round a needle, which ſeemed to us to be gold: each of them had a dagger, the handle of which was gold alſo. Their canoes were made out of hollowed trees, and they managed them very indifferently. I could have wiſhed to land upon this iſland, but as we had brought the ſhip to, in order to wait for theſe canoes, and as the current ſet to the northward with extreme rapidity, we had drifted a great way to leeward, and our efforts to reach it would perhaps have been in vain: beſides, we had not a moment to loſe, and it was of the higheſt importance to us to get out of the Japan ſeas before the month of June; a period of ſtorms and hurricanes, which render theſe ſeas the moſt dangerous in the whole world.

" It is clear, that veſſels which might be in want would readily provide themſelves with proviſion, wood, and water, in this iſland, and perhaps even carry on a little trade; but as it is not more than three or four leagues in circumference, there is no great probability that its population exceeds four or five hundred perſons; and a few gold needles are not of themſelves a proof of wealth." Our author, by obſervation, found the latitude of Kumi to be 24° 33′ north; its longitude 120° 56′ eaſt from Paris.

Kuriles,
||
Kyuquot.

KURILES, are a cluſter of iſlands, of which ſome account has been given under the word Kuril, in the *Encyclopædia*. In addition to that article, the following particulars are worthy of notice: Of the 21 iſlands belonging to Ruſſia, which are diſtinguiſhed from each other, not by names, but by numbers, four only are inhabited, viz. thoſe which are called the firſt, the ſecond, the thirteenth, and the fourteenth. The laſt two may indeed be counted only as one, becauſe the inhabitants all paſs the winter upon N° 14, and return to N° 13 to paſs the ſummer months. The others are entirely uninhabited, the iſlanders only landing there occaſionally from their canoes for the ſake of hunting foxes and otters. Several of theſe laſt mentioned iſlands are no better than large rocks, and there is not a tree on any one of them. The currents are very violent between the iſlands, particularly at the entrance of the channels, ſeveral of which are blocked up by rocks on a level with the ſea. The population of the four inhabited iſlands amounts at moſt to 1400 ſouls. The inhabitants are very hairy, wear long beards, and live entirely upon ſeals, fiſh, and the produce of the chace. When viſited by M. Perouſe, they had juſt been exempted for ten years from the tribute uſually paid to Ruſſia, becauſe the number of otters on their iſlands is very much diminiſhed. Theſe poor people are good, hoſpitable, and docile, and have all embraced the Chriſtian religion. The more ſouthern and independant iſlanders ſometimes paſs in canoes the channels that ſeparate them from the Ruſſian Kuriles, in order to give ſome of the commodities of Japan in exchange for peltries.

KYUQUOT, a large ſound or bay on the N. W. coaſt of N. America, having Roberts Iſland on the one ſide. N. lat. 50°, W. long. 127° 20′.—*Morse.*

L.

Labdaſſeba,
||
Laboratory.

LABDASSEBA, a tribe of ſavage Arabs who inhabit the deſart of Sahara in Africa. They are the moſt powerful of all thoſe tribes except the Ouadelims; and they reſemble theſe ſo much in every thing, that we ſhall give an account of the manners of both under the title Ouadelims, and of their country under that of Sahara.

LABORATORY, is an apparatus ſo neceſſary to the chemiſt, that every contrivance to render it more convenient, or to leſſen the expence of it, muſt contribute greatly to the advancement of ſcience. The abilities of *Morveau* alias *Guyton*, and the ſucceſs with which he has proſecuted the ſtudy of chemiſtry, are well known; and therefore his different methods of ſaving time and expence in making chemical experiments muſt be worthy of the notice of younger chemiſts.

In the ſecond volume of the Memoirs of the Ancient Academy of Dijon, we have a deſcription by him of a box containing a kind of portable laboratory, compoſed of a lamp with three wicks, diſpoſed in the figure of an equilateral triangle, to form an internal current of air, with ſupports for the different veſſels of digeſtion, diſtillation, evaporation, &c. He made a ſolution of ſilver with common aqua fortis and the metal in an alloyed ſtate, which anſwered very well as a re-agent, without having occaſion for any other utenſils but this box and apothecary's phials, which are every where to be found.

Laboratory.

This apparatus, however, was confined in its application, and he ſoon thought of improving it. He conſtructed a lamp, on the principles of Argand, with three concentric circular wicks, each having an interior and exterior current of air. The effect ſurpaſſed his expectations with regard to the intenſity of the heat; but it was difficult to prevent the deſtruction of the hard ſolder round the wicks; and the glaſs retorts were frequently melted at the bottom, and disfigured. It was attended with other inconveniences, and the quantity of oil conſumed was great.

A ſhort time afterwards, it occurred to him to ſubſtitute, inſtead of the glaſs chimney of Argand's lamp, a cylinder of copper with an indented part or ledge a few millimetres (ſee Revolution, *Encycl.* n° 183.) above the flame, to perform the office of the indented chimney of glaſs, and by that means to render it practicable to raiſe the wick to a certain height without ſmoaking. This cylinder has three branches like a chaffing-diſh. By this apparatus two or three decilitres of water (about half an Engliſh wine pint) may be brought to boil in a copper or glaſs veſſel in about ſix or ſeven minutes. It has ſerved for a number of operations; but it was not till after he had obſerved the degree of heat obtained from the lamp in its ordinary ſtate, and particularly ſince he had ſubſtituted inſtead of the metallic tube a chimney of glaſs cut off at the length of three centimetres (rather more than one Engliſh inch) above the contraction, that he perceived all the advantages it was capable of affording; and that by means of a moveable ſupport for the reception of the different veſſels, which may be fixed at pleaſure by a thumb-ſcrew, this lamp furnace, at the ſame time that it gives light, and conſequently without any additional expence, may with facility be uſed for almoſt every one of the operations of chemiſtry; ſuch as digeſtions, ſolutions, cryſtallizations, concentrations; the rectification of acids; diſtillations on the ſand-bath, or by the naked fire; incinerations of the moſt refractory reſidues; analyſes with the pneumatic apparatus, or of minerals by the ſaline fuſion, &c. “I have not (ſays he) hitherto met with any exception but for complete vitrifications and cupellations; for even the diſtillations to dryneſs may be performed with ſome precautions, ſuch as that of transferring the matter into a ſmall retort blown by the enameller's lamp, and placing its bottom on a little ſand-bath in a thin metallic diſh.” The ſupport here mentioned is ſimply a copper ring eight centimetres (3,15 inch.) in diameter, which is raiſed or lowered by ſliding on a ſtem of the ſame metal. Nothing more was required but to adapt it to the ſquare iron ſtem which paſſes through the reſervoir of the lamp. The connection is made by a piece of wood, in order that leſs of the heat might be diſperſed. As the lamp itſelf is capable of being moved on its ſtem, it is eaſy to bring it nearer or remove it at pleaſure from the veſſels, which remain fixed; a circumſtance which, independent of the elevation or depreſſion of the wick, affords the means of heating the retorts by degrees, of moderating or ſuppreſſing the fire inſtantly, or of maintaining it for ſeveral hours at a conſtant or determinate intenſity, from the almoſt inſenſible evaporation of cryſtallizable ſolutions to the ebullition of acids; properties never poſſeſſed by the athanor, of which chemiſts have boaſted ſo much. The advantage of theſe will be properly valued by thoſe operators who know that the moſt experienced and the moſt attentive chemiſts meet with frequent accidents, by which both their veſſels and the products of their operations are loſt for want of power in the management of the fire.”

For the analyſis of ſtones, ſuch as the cryſtals of tin, the ſhortened chimney of glaſs is to be uſed; and the proceſs is to be begun by placing the mixture in a capſule of platina or ſilver 2¾ inches in diameter. This capſule is to be placed on the ſupport, and the heat regulated in ſuch a manner, that ebullition ſhall take place without throwing any portion of the matter out of the veſſel. As ſoon as its contents are perfectly dry, they are to be transferred into a very thin crucible of platina, of which the weight is about 252½ grains Engliſh, and its diameter one inch and three-fourths. This crucible reſts on a ſmall ſupport of iron-wire, which ſerves to contract the ring; and the wick being at its greateſt elevation, with the ring lowered to the diſtance of 9¾ inches from the upper rim of the chimney, Guyton produced, in leſs than twenty minutes, the ſaline fuſion to ſuch a degree, that from the commencement of the operation the decompoſition proceeded as far as to 0.70 of the mineral. The ſame apparatus, that is to ſay, with the ſhortened chimney, ſerves for oxidations, incinerations, torrefactions, and diſtillations to dryneſs.

In ſuch operations as require a leſs heat, he leaves the lamp with its large chimney abſolutely in the ſame ſtate as when it is uſed for illumination; and by raiſing and lowering either the ring which ſupports the veſſel, or the body of the lamp if the veſſels be fixed in communication with others, he graduates the heat at pleaſure. Vinegar diſtils without interruption at 2⅓ inches Engliſh from the upper termination of the chimney, that is to ſay, 7½ inches Engliſh from the flame. Water is made to boil in eight minutes, at the ſame height, in a glaſs veſſel containing one wine pint Engliſh, and is uniformly maintained at the diſtance of 8⅔ inches from the flame.

“I muſt not in this place (ſays our author) omit to mention a ſlight obſervation which this proceſs has afforded, becauſe it may lead to uſeful applications, and tends to point out one great advantage of this method of operating; namely, that an infinity of circumſtances may be perceived, which might not even be ſuſpected when the whole proceſs is carried on within a furnace. I have remarked, as did likewiſe ſeveral of my colleagues who were then preſent, that a column of bubbles conſtantly roſe from a fixed point of the retort on one ſide of the bottom. We were of opinion, that ſome particle of mattter was in that place incorporated with the glaſs, which had a different capacity for heat from that of the reſt of the glaſs. In order to verify this conjecture, I endeavoured the following day to diſtil the ſame quantity of the ſame water in the ſame retort, after having introduced a button of cupelled ſilver, weighing nine decigrammes (20½ grains). At the commencement of the operation there was a ſmall ſtream of bubbles from the ſame point as before; but a ſhort time afterwards, and during the whole remaining time of operating, the largeſt and moſt inceſſant ſtream of bubbles roſe from the circumference of the button, which was often diſplaced by the motion; and in proportion to the time the product of the diſtillation was ſenſibly greater. Whence we may conclude, that metallic wires or rods, diſtributed through a maſs of water required to be kept in a ſtate of ebullition, and placed a little below its ſurface, would produce, without any greater expence of fuel, nearly the ſame effect as thoſe cylinders filled with ignited matter which are made to paſs through the boilers.”

We have related this fact in Guyton's own words, or at leaſt in a faithful tranſlation of them; and we are far from calling it in queſtion, for it is a fact which has been often obſerved; but we think his inference from it too haſtily drawn. It is not conceivable that heat can be more rapidly conveyed through a maſs of liquid by the conducting power of metal, than by a free circulation; but we agree with what ſeems to be Mr Nicholſon's opinion*, that the thin ſtratum of water beneath the button becomes more ſuddenly and violently elaſtic than elſewhere, and therefore riſes regularly to the ſurface. The whole of this phenomenon the reader will find explained in our article STEAM (*Encycl.*), n° 10. But this is a digreſſion.

We return therefore to Guyton's laboratory, of which the reader will form a diſtinct notion from plate XXXIII. where fig. 1. repreſents the whole apparatus ready mounted for diſtillation, with the tube of ſafety and a pneumatic receiver. A is the body or reſervoir of the uſual lamp of Argand, with its ſhade and glaſs chimney. The lamp may be raiſed or lowered at pleaſure by means of the thumb ſcrew B, and the wick riſes and falls by the motion of the ſmall toothed wheel placed over the waſte cup. This conſtruction is moſt convenient, becauſe it affords the facility of altering the poſition of the flame with regard to the veſſels, which remain fixed; and the troubleſome management of bended wires above the flame for the ſupport of the veſſels is avoided, at the ſame time that the flame itſelf can be brought nearer to the matter on which it is intended to act. D, a ſupport conſiſting of a round ſtem of braſs, formed of two pieces which ſcrew together at about two-thirds of its height. Upon this the circular ring E, the arm F, and the nut G ſlide, and are fixable each by its reſpective thumb-ſcrew. The arm alſo carries a moveable piece H, which ſerves to ſuſpend the veſſels in a convenient ſituation, or to ſecure their poſition. The whole ſupport is attached to the ſquare iron ſtem of the lamp by a piece of hard wood I, which may be fixed at any required ſituation by its ſcrew. K repreſents a ſtand for the receivers. Its moveable tablet L is fixed at any required elevation by the wooden ſcrew M. The piece which forms the foot of this ſtand is fixed on the board N; but its relative poſition with regard to the lamp may be changed by ſliding the foot of the latter between the pieces OO. P, another ſtand for the pneumatic trough. It is raiſed or lowered, and fixed to its place, by a ſtrong wooden ſcrew, Q. R is a tube of ſafety, or reverſed ſyphon, which ſerves, in a great meaſure, to prevent the bad effects of having the veſſels either perfectly cloſed, or perfectly open. Suppoſe the upper bell-ſhaped veſſel to be nearly of the ſame magnitude as the bulb at the lower end of the tube, and that a quantity of water, or other ſuitable fluid, ſomewhat leſs than the contents of that veſſel, be poured into the apparatus: In this ſituation, if the elaſticity of the contents of the veſſels be leſs than that of the external air, the fluid will deſcend into the bulb, and atmoſpheric air will follow and paſs through the fluid into the veſſels: but, on the contrary, if the elaſticity of the contents be greater, the fluid will be either ſuſtained in the tube, or driven into the bell-ſhaped veſſel; and if the force be ſtrong enough, the gaſeous matter will paſs through the fluid, and in part eſcape.

Fig. 2. Shews the lamp furnace diſpoſed to produce the ſaline fuſion; the chimney of glaſs ſhortened; the ſupport D turned down; the capſule of platina or ſilver S placed on the ring very near the flame.

Fig. 3. The ſame part of the apparatus, in which, inſtead of the capſule, a very thin and ſmall crucible of platina T is ſubſtituted, and reſts upon a triangle of iron wire placed on the ring.

Fig. 4. Exhibits the plan of this laſt diſpoſition.

LABRADOR, a large lake which by its numerous branches forms a water communication through great part of the iſland of Cape Breton. In ſome maps it is called St Peter's Lake.—*Morſe.*

LACERTA, in aſtronomy. See ASTRONOMY, n° 406. *Encycl.*

LACHAWANNOCK, a mountain in the north-weſtern part of Pennſylvania.—*Morſe.*

LACHAWANNOCK, a townſhip in Luzerne county, Pennſylvania.—*ib.*

LACK, a townſhip in Mifflin county, Pennſylvania.—*ib.*

LACMUS, a dye ſtuff prepared by the Dutch from the LICHEN ROCELLA, which ſee in this *Supplement.*

LA COLE, a river which falls into lake Champlain from the W. 5 miles S. S. W. of Nut-Iſland, after a ſhort courſe.—*Morſe.*

LACOMIC, a ſmall creek which empties through the weſt bank of Alleghany river, in Pennſylvania, oppoſite Licking Creek, a ſhort diſtance below fort Franklin.—*ib.*

LACSHA, the Indian name of the lac inſect, which has been deſcribed in the *Encyclopædia* under the title COCCUS, *Species* 5. Since that article was publiſhed, a deſcription of that inſect, which is more to be depended upon, has been given to the world in the ſecond volume of the Aſiatic Reſearches. It is by Mr Roxburgh, ſurgeon on the Madras eſtabliſhment, and was communicated to the Society by Dr James Anderſon phyſician at Fort St George, who obſerves, that Mr Roxburgh's diſcovery will bring the lacſha as a genus into the claſs *Hemiptera* of Linnæus.

" Some pieces of very freſh-looking lac (ſays Mr Roxburgh) adhering to ſmall branches of mimoſa cinerea, were brought me from the mountains on the 20th of November 1789. I kept them carefully, and to-day, the 4th of December, fourteen days from the time they came from the hills, myriads of exceedingly minute animals were obſerved creeping about the lac and branches it adhered to, and more ſtill iſſuing from ſmall holes over the ſurface of the cells: other ſmall and perforated excreſcences were obſerved with a glaſs amongſt the perforations, from which the minute inſects iſſued, regularly two to each hole, and crowned with ſome very fine white hairs. When the hairs were rubbed off, two white ſpots appeared. The animals, when ſingle, ran about pretty briſkly, but in general they were ſo numerous as to be crowded over one another. The body is oblong, tapering moſt towards the tail, below plain, above convex, with a double, or flat margin: laterally on the back part of the thorax are two ſmall tubercles, which may be the eyes: the body behind the thorax is croſſed with twelve rings: legs ſix; feelers (antennæ) half the length of the body, jointed, hairy, each ending in two hairs as long as the antennæ: rump, a white point between two terminal hairs, which are as long as the body of the animal. The mouth I could not ſee. On opening the cells, the ſubſtance that they were formed of cannot be better deſcribed, with reſpect to appearance, than by ſaying it is like the tranſparent amber that beads are made of: the external covering of the cells may be about half a line thick, is remarkably ſtrong, and able to reſiſt injuries: the partitions are much thinner: the cells are in general irregular ſquares, pentagons and hexagons, about an eighth of an inch in diameter, and one quarter deep: they have no communication with each other. All thoſe I opened during the time the animals were iſſuing, contained in one half, a ſmall bag filled with a thick red jelly-like liquor, replete with what I take to be eggs: theſe bags, or utriculi, adhere to the bottom of the cells, and have each two necks, which paſs through perforations in the external coat of the cells, forming the fore mentioned excreſcences, and ending in ſome very fine hairs. The other half of the cells have a diſtinct opening, and contain a white ſubſtance, like ſome few filaments of cotton rolled together, and numbers of the inſects themſelves ready to make their exit. Several of the ſame inſects I obſerved to have drawn up their legs, and to lie flat: they did not move on being touched, nor did they ſhew any ſigns of life with the greateſt irritation.

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* *Journal*, Auguſt 1798, note, page 212.

" *December* 5. The ſame minute hexapedes continue iſſuing from their cells in numbers: they are more lively, of a deepened red colour, and fewer of the motionleſs ſort. To-day I ſaw the mouth: it is a flattened point about the middle of the breaſt, which the little animal projects on being compreſſed.

" *December* 6. The male inſects I have found to-day: a few of them are conſtantly running among the females moſt actively: as yet they are ſcarce more, I imagine, than one to 5000 females, but twice their ſize. The head is obtuſe; eyes black, very large; antennæ clavated, feathered, about $\frac{2}{3}$ds the length of the body: below the middle an articulation, ſuch as thoſe in the legs: colour between the eyes a beautiful ſhining green: neck very ſhort: body oval, brown: abdomen oblong, the length of body and head: legs ſix: wings membranaceous, four, longer than the body, fixed to the ſides of the thorax, narrow at their inſertions, growing broader for $\frac{2}{3}$ds of their length, then rounded; the anterior pair is twice the ſize of the poſterior: a ſtrong fibre runs along their anterior margins: they lie flat, like the wings of a common fly when it walks or reſts: no hairs from the rump: it ſprings moſt actively to a conſiderable diſtance on being touched: mouth in the under part of the head: maxillæ tranſverſe. To-day the female inſects continue iſſuing in great numbers, and move about as on the 4th.

" *December* 7. The ſmall red inſects ſtill more numerous, and move about as before: winged inſects, ſtill very few, continue active. There have been freſh leaves and bits of the branches of both *Mimoſa Cinerea* and *Corinda* put into the wide mouthed bottle with them: they walk over them indifferently, without ſhewing any preference, or inclination to work or copulate. I opened a cell whence I thought the winged flies had come, and found ſeveral, eight or ten, more in it, ſtruggling to ſhake off their incumbrances: they were in one of thoſe utriculi mentioned on the 4th, which ends in two mouths, ſhut up with fine white hairs, but one of them was open for the exit of the flies; the other would no doubt have opened in due time: this utriculus I found now perfectly dry, and divided into cells by exceeding thin partitions. I imagine, before any of the flies made their eſcape, it might have contained about twenty. In theſe minute cells with the living flies, or whence they had made their eſcape, were ſmall dry dark coloured compreſſed grains, which may be the dried excrements of the flies."

LADIES *Iſland*, a ſmall iſland of S. Carolina, near Port-Royal.—*Morse.*

LAGOON, one of the new diſcovered iſlands in the South Sea. Captain Cook viſited it in 1769. S. lat. 18° 47′, W. long. from Greenwich 139° 28′.—*ib.*

LAGUNA, a town of Peru, ſituated on Amazon river, S. E. of the town of Borja.—*ib.*

LA GUAYRA, a maritime fortified town in Caraccas, a province of Terra Firma. This town, and Puerto Cabela are the chief in the province.—*ib.*

LAMANON (Robert Paul), of the academy at Turin, correſpondent of the Academy of Sciences at Paris, and member of the Muſeum in the ſame city, was born at Salon in Provence, in 1752, of an old and reſpectable family. Being a younger ſon, he was deſtined for the church, and ſent to Paris to complete his theological ſtudies; but getting acquainted with the philoſophers (as they called themſelves), he ſoon loſt all reliſh for the ſtudy of theology, and devoted himſelf to the phyſical ſciences, eſpecially thoſe of chemiſtry and mineralogy. Into the church, however, he got, and roſe to the dignity of canon; but by the death of his father and elder brother, having acquired the right of directing his own future exertions, he haſtened to quit a profeſſion, towards which he felt no partiality.

A prelate, then in high favour at court, hearing of Lamanon's intention of quitting his office of canon, offered him a conſiderable ſum, to induce him to reſign in favour of one of his dependents. The chapter of Arles, replied our young eccleſiaſtic, did not ſell me my benefice, I ſhall therefore reſtore it in the ſame manner that I received it. This conduct was certainly meritorious; and his eulogiſt *Ponce* mentions another trait of his character, which ſets him in a very amiable point of view; he refuſed to accept of his paternal inheritance, otherwiſe than as an equal ſharer with his brothers and ſiſters.

Thus liberated from the trammels of his former profeſſion, Lamanon applied himſelf with uncommon ardour to ſtudy. Eager to raiſe the awful veil that conceals from our eyes the ſecrets of nature; perſuaded, that even the greateſt genius only amuſes itſelf with falſe ſyſtems in the ſilence of a cabinet; convinced of the neceſſity of much and various obſervation, and of ſurpriſing Nature, as it were, in the very fact, in order to penetrate into the ſublimity of her operations;—our young philoſopher travelled through Provence and Dauphine, and ſcaled the Alps and Pyrenees. At the ſight of theſe vaſt natural laboratories the bent of his mind burſt forth inſtantaneouſly: he climbed to the ſummit of rocks, and explored the abyſs of caverns, weighed the air, analyſed ſpecimens, and, in his ardent fancy, having attained the ſecrets of creation, he formed a new ſyſtem of the world. On his return home, he applied with additional intereſt to the ſtudy of meteorology, mineralogy, natural philoſophy, and the other branches of the hiſtory of nature.

Whilſt he was meditating a viſit to Paris for the purpoſe, as his eulogiſt expreſſes himſelf, of converſing with the luminaries of ſcience, the inhabitants of the commune of Salon, having loſt a cauſe againſt their lord, unanimouſly elected Lamanon, with whoſe integrity and abilities they were well acquainted, to go and ſolicit of the council the repeal of an unjuſt decree that had been obtained by partiality. The reply of the young philoſopher on this occaſion is an additional proof of his uncommon diſintereſtedneſs. "As I intend (ſaid he) to go to Paris on buſineſs of my own, I cannot think of accepting your offer of 24 livres daily pay: a twelfth of this ſum will cover the extraordinary expences of the journeys that I ſhall be obliged to make to Verſailles on your account." He had the ſatisfaction of complete ſucceſs in the buſineſs thus undertaken.

Having ſatisfied his curioſity in Paris, he went over to England. During the paſſage, though much incommoded by ſea-ſickneſs, and in imminent hazard of being overwhelmed by the tumbling waves of a very ſtormy ſea, he cauſed himſelf to be tied to the main-maſt, in order to contemplate at leiſure ſo grand and fearful a ſpectacle. The burſts of thunder, the howling of the wind, the brilliancy of the lightning, the glancing of the ſpray which covered him every moment, theſe objects, ſo terrible to an ordinary man, threw him into a kind of mental intoxication, and he has often declared, that this day was the moſt exquiſite of his whole life.

Convinced that the friendſhip of an eminent man elevates the ſoul, excites generous emulation, and becomes an additional ſtimulus to one whoſe delight is ſtudy, and whoſe moſt preſſing want is an object on which to place his affection, Lamanon anxiouſly endeavoured to merit the regard of CONDORCET, ſo well known by his talents, his impieties, his rebellion, and his misfortunes. This academician, juſtly conſidering that an apoſtate prieſt would be ready to join the conſpiracy of the philoſophiſts againſt the altar and the throne, received Lamanon with diſtinction, and at length admitted him to his moſt intimate friendſhip.

During the three ſucceſſive years that Lamanon ſpent at Paris, he followed with care the track of thoſe learned ſocieties, of which he had been elected a member. He became at this period, together with Count de Gebelin, and ſome other philoſophers and artiſts, one of the founders of the Muſeum, the greater part of the members of which are now reunited in the open ſociety of ſciences, letters, and arts, at Paris. Among the different papers of his that were read at various meetings of theſe ſocieties, Ponce mentions with particular approbation what he calls *a notice* of Adam de Crapone, an eminent hydraulic engineer; a memoir on the Cretins; a memoir on the theory of the winds; a treatiſe on the alteration in the courſe of rivers, particularly the Rhone; and another on an enormous bone belonging to ſome cetaceous fiſh, that was dug up at Paris in laying the foundations of a houſe in the *rue Dauphine*. We have not ſeen theſe memoirs; but as their author was the friend of Condorcet, and fancied that he had attained the ſecrets of creation, we can eaſily conceive their tendency.

Having reſolved again to reviſit Switzerland and Italy, Lamanon firſt went to Turin, where he allied himſelf to the learned of that country. During his ſtay there, the brilliant novelty diſcovered by Montgolfier was occupying the attention of all the philoſophers of Europe. Lamanon, deſirous of making ſome experiments of this kind himſelf, aſcended in a balloon from the city of Turin; but not perceiving in this diſcovery, which had at firſt highly intereſted him, an object of public utility; not foreſeeing, that one day, on the plains of Fleurus, it would be the cauſe of rallying and eſtabliſhing victory under the ſtandards of France, he returned to his favourite occupations. Purſuing his route from Piedmont, he viſited Italy, and returned by Switzerland, where he explored the Alps and aſcended the ſummit of Mont Blanc: thence returning, loaden with the ſpoils of the countries which he had traverſed, to Provence, he employed himſelf in the arrangement of the intereſting fruits of his journey.

Of the ſcrupulous exactneſs of his obſervations, his eulogiſt gives the following inſtance. "Being convinced that the plain of Crau, divided by the channel of the Durance, had formerly been a lake, he wiſhed to be abſolutely aſſured of it. For this purpoſe he collected a ſpecimen of each of the ſtones that are to be found in this vaſt plain; the number of theſe he found to amount to nineteen; then tracing the courſe of the river towards its head, near the frontiers of Savoy, he obſerved, that above each junction of the tributary ſtreams with the Durance, the variety of pebbles diminiſhed. Afterwards aſcending the current of each of theſe ſmaller ſtreams, he diſcovered on their banks the original rock of every pebble that overſpreads the plain of Crau; thus inconteſtably proving, that this plain was anciently a lake formed by the waters of the Durance, and the ſtreams that fall into it. If all philoſophers (ſays our author) would conduct their examinations with equal preciſion, certain hypotheſes, more brilliant than ſolid, would not find ſo many admirers; the charm of imagination, and the graces of ſtyle, would not ſo often encroach upon the impreſcriptible rights of nature and truth."

To citizen Ponce this appears a demonſtration of Lamanon's theory: but we cannot ſay that it does ſo to us. It may be a kind of proof, though not a demonſtration, that in ſome convulſion of nature, ſtones had been rolled from the rock, and the plain of Crau, for a time, overflowed by the Durance; but it ſurely furniſhes no evidence of that plain's having ever been *a permanent lake*. It *may* have been ſo; but ſuch inveſtigations as this will not guard philoſophers againſt the deluſions of favourite hypotheſes.

It was at the time when Lamanon was preparing for the preſs his great work on the *Theory of the Earth*, that the French government conceived the vaſt project of completing the diſcoveries of Captain Cook: the academy of ſciences was entruſted with the care of ſelecting men capable of rectifying our notions of the ſouthern hemiſphere, of improving hydrography, and advancing the progreſs of natural hiſtory. Condorcet, not knowing any one better qualified for this laſt department than Lamanon, wrote to him an invitation to ſhare the danger and glory of this great enterprize. He accepted with eager tranſport a propoſal that fulfilled his higheſt expectations, haſtened to Paris, refuſed in a conference with the miniſter the ſalary that was offered, took a haſty leave of his friends, and departed for Breſt.

On the 1ſt of Auguſt 1785, the armament ſet ſail under the orders of La Perouſe, an experienced commander, whoſe patriotiſm and ſcientific zeal were equal to his courage and good ſenſe, and who had already merited the public confidence. The philoſophers of all Europe were in expectation of thoſe uſeful diſcoveries, the probable fruit of the zeal and talents employed in the expedition. The beginning of the voyage was proſperous. After various delays, and a multitude of obſervations, the two veſſels arrived at the iſland of Maouna, one of the ſouthern Archipelago. The impatient Lamanon, eager to aſſure himſelf of the truth of the publiſhed accounts of that country, debarked with Langle, the ſecond in command. At the moment of their return, the natives, in hopes of booty, which had been excited by the number of preſents that they had received, ſeized upon the boats, and attacked the party. The French were obliged to have recourſe to arms for ſelf-defence, and a deſperate combat enſued. Lamanon, Langle, and ten of the two boats crews, fell a ſacrifice to the fury of theſe barbarians.

Thus periſhed Lamanon, a young man ardent in the purſuits of ſcience, to a high degree diſintereſted, and a zealot in what he thought the cauſe of liberty. He refuſed the ſalary which was allotted to him when he was appointed to this unfortunate expedition; for "if I do not feel ſatisfied (ſaid he) on board the veſſel; if my inclination or curioſity lead me to quit the ſhip,—I ſhould be unhappy if any power in the world had acquired the right of preventing me."

According to M. Ponce, Lamanon ſeemed born to bring about a revolution in ſcience: the depth of his ideas, the energy of his charactar, the ſagacity of his mind, united to that lively curioſity that can draw inſtruction out of any thing, and leaves nothing unexplored, would have led him to the moſt valuable diſcoveries. In perſon he was tall; and to great vivacity and expreſſion of feature added prodigious ſtrength and activity; in a word, Nature formed him with ſuch care, as if ſhe had intended him for one of thoſe few who are deſtined to great exploits. His ſtyle was nervous, often poetical, without loſing ſight of propriety, and the language of ſentiment might frequently be diſcovered in the midſt of ſtrong and ſtriking expreſſions; and if he wanted the exquiſitely dazzling poliſh of diction, he was eminently gifted with the preciſion of logical reaſoning, which commands attention and enforces perſuaſion.

LA MOELLE, a large river in the N. W. part of Vermont. Its general courſe is weſterly: after running about 75 miles, and receiving 14 leſſer ſtreams, it falls into Lake Champlain at Colcheſter, 5 miles north of the mouth of Onion river, and is of about the ſame magnitude.—*Morse.*

LAMBAYEQUE, a town on the road from Guayaquil to Lima in Peru, four leagues from Morrope. It conſiſts of about 1,500 houſes, built of different materials, but in general of bajareques or unburnt bricks. The meaneſt of the houſes are the habitations of the Indians, which conſiſt entirely of canes. The number of its inhabitants amounts to above 30,000, ſome of whom are opulent; but the generality are poor Spaniards, Mulattoes, Meſtizoes, and Indians. It has a large and elegant ſtone church. It is the reſidence of a corregidor, having under his juriſdiction, beſides many other towns, that of Morrope. One of the two officers of the revenue appointed for Truxillo, alſo reſides here. S. lat. 6° 41′ 37″, W. long. 76° 15′.—*ib.*

LAMP (ſee *Encycl.* is an inſtrument compriſing three articles which demand our attention, *viz.* the oil, the wick, and the ſupply of air. It is required that the oil ſhould be readily inflammable, without containing any fetid ſubſtance which may prove offenſive, or mucilage, or other matter, to obſtruct the channels of the wick. Mr Nicholſon ſays,* that he knows of no proceſs by which oils can be meliorated for this purpoſe, except that of waſhing with water containing acid or alkali. Either of theſe is ſaid to render the mucilage of animal oils more ſoluble in water; but acid is to be preferred, becauſe it is leſs diſpoſed to combine with the oil itſelf. Perhaps oil might be deprived of all fetid ſmell in burning, by being made to paſs through Collier's filtering apparatus, deſcribed under the word FILTER in this *Suppl.*

The office of the wick appears to be chiefly, if not ſolely, to convey the oil by capillary attraction to the place of combuſtion. As the oil is conſumed and flies off, other oil ſucceeds, and in this way a continued current of oil and maintenance of the flame are effected. But as the wicks of lamps are commonly formed of combuſtible matter, it appears to be of ſome conſequence what the nature and ſtructure of this material may be. It is certain that the flame afforded by a wick of ruſh differs very conſiderably from that afforded by cotton; though perhaps this difference may, in a great meaſure, depend on the relative dimenſions of each. And if we may judge from the different odour in blowing out a candle of each ſort, there is ſome reaſon to ſuſpect that the decompoſition of the oil is not effected preciſely in the ſame manner in each. We have alſo ſome obſcure accounts of prepared wicks for lamps, which are ſtated to poſſeſs the property of facilitating the combuſtion of very impure oils, ſo that they ſhall burn for many hours without ſmoke or ſmell.

The economical wicks of M. Leger, concerning which a report was preſented to the Academy at Paris in 1782 by Condorcet, Lavoiſier, and De Milly, were compoſed of cotton of different ſizes and forms, namely, round and flat, according to the uſe they were intended to ſerve. They were covered with a fat ſubſtance, of a ſmell not diſagreeable, but feebly aromatic. From the trials of theſe commiſſaries it was aſcertained: 1. That they afforded a clearer flame, with leſs undulation. 2. That they conſumed ſomewhat leſs oil; and, 3. That they poſſeſſed the remarkable property of affording neither ſmell nor ſmoke, however common the oil made uſe of. When uſing a lamp with a flat wick, we have ourſelves found a piece of clean cotton ſtocking anſwer the purpoſe better than the cotton wicks which are ſold in the ſhops.

The acceſs of air is of the laſt importance in every proceſs of combuſtion. When a lamp is fitted up with a very ſlender wick, the flame is ſmall, and of a brilliant white colour: if the wick be larger, the combuſtion is leſs perfect, and the flame is brown: a ſtill larger wick not only exhibits a brown flame, but the lower internal part appears dark, and is occupied by a portion of volatiliſed matter, which does not become ignited until it has aſcended towards the point. When the wick is either very large or very long, part of this matter eſcapes combuſtion, and ſhews itſelf in the form of coal or ſmoke. The different intenſity of the ignition of flame, according to the greater or leſs ſupply of air, is remarkably ſeen by placing a lamp with a ſmall wick beneath a ſhade of glaſs not perfectly cloſed below, and more or leſs covered above. While the current of air through the glaſs ſhade is perfectly free, the flame is white; but in proportion as the aperture above is diminiſhed, the flame becomes brown, long, wavering, and ſmoky; it

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* Journal, vol. i. nº 2.

inſtantly recovers its original whiteneſs when the opening is again enlarged. The inconvenience of a thick wick has been long ſince obſerved, and attempts made to remove it; in ſome inſtances, by ſubſtituting a number of ſmall wicks inſtead of a larger; and in others, by making the wick flat inſtead of cylindrical. The moſt ſcientific improvement of this kind, though perhaps leſs ſimple than the ordinary purpoſes of life demand, is the well known lamp of Argand, deſcribed in the *Encyclopædia.*

Much has been ſaid of this lamp, and great praiſe laviſhed on the inventor. It cannot indeed be denied that it was a very pretty invention, nor have we the ſlighteſt wiſh to detract from the merit of M. Argand; but truth compels us to ſay, that the ſame thought had occurred to others as early as to him, and that lamps had been conſtructed on his principles long before he had publiſhed an account of his lamp to the world (A).

Many ingenious men have endeavoured to determine the moſt economical method of lighting up large halls and workhouſes by means of different lamps and candles; and when the expence of tallow and oil is conſidered, it will be admitted that they could not employ their time in a manner more beneficial to the poor and the induſtrious. Among others, Count Rumford and M. Haſſenfratz have turned their attention to this ſubject; and the reſults of their inveſtigations are worthy of notice. To the Count, a method occurred for meaſuring the relative quantities of light emitted by lamps of different conſtructions, which is at once ſimple and accurate. It is as follows:

Let the two burning lamps, or other lights to be compared, be called A and B; and let them be placed at equal heights upon two light tables, or moveable ſtands, in a darkened room; let a ſheet of clean white paper be equally ſpread out, and faſtened upon the wainſcot, or ſide of the room, at the ſame height from the floor as the lights; and let the lights be placed overagainſt this ſheet of paper, at the diſtance of ſix or eight feet from it, and ſix or eight feet from each other, in ſuch a manner, that a line drawn from the centre of the paper, perpendicular to its ſurface, ſhall biſect the angle formed by lines drawn from the lights to that centre; in which caſe, conſidering the ſheet of paper as a plane ſpeculum, the one light will be preciſely in the line of reflection of the other.

This may be eaſily performed, by actually laying a piece of a looking-glaſs, ſix or eight inches ſquare, flat upon the paper, in the middle of it; and obſerving, by means of it, the real lines of reflection of the lights from that plane, removing it afterwards, as ſoon as the lights are properly arranged. When this is done, a ſmall cylinder of wood, about ¼th of an inch in diameter, and ſix inches long, muſt be held in a vertical poſition, about two or three inches before the centre of the ſheet of paper, and in ſuch a manner, that the two ſhadows of the cylinder, correſponding to the two lights, may be diſtinctly ſeen upon the paper.

If theſe ſhadows ſhould be found to be of unequal denſities, which will almoſt always be the caſe, then that light whoſe correſponding ſhadow is the denſeſt muſt be removed farther off, or the other muſt be brought nearer to the paper, till the denſities of the ſhadows appear to be exactly equal; or, in other words, till the denſities of the rays from the two lights are equal *at the ſurface of the paper;* when, the diſtances of the lights from the centre of the paper being meaſured, the ſquares of thoſe diſtances will be to each other as the real intenſities of the lights in queſtion at their ſources.

If, for example, the weaker light being placed at the diſtance of four feet from the centre of the paper, it ſhould be found neceſſary, in order that the ſhadows may be of the ſame denſity, to remove the ſtronger light to the diſtance of eight feet from that centre, in that caſe, the real intenſity of the ſtronger light will be to that of the weaker as 8^2 to 4^2; or as 64 to 16; or 4 to 1: and ſo for any other diſtances.

It is well known, that when any quality proceeds from a centre in ſtraight lines in all directions, like the light emitted by a luminous body, its intenſity at any given diſtance from that centre will be as the ſquare of that diſtance inverſely; and hence it is clear, that the intenſities of the lights in queſtion, at their ſources, muſt be to each other as the ſquares of their diſtances from that given point *where their rays uniting are found to be of equal denſity.* For, putting $x =$ the intenſity of B, if P repreſents the point where the rays from A and from B meeting are found to be of equal denſity or ſtrength, and if the diſtance of A from P be $= m$, and the diſtance of B from the ſame point P $= n$; then, as the intenſity of the light of A at P is $= \frac{x}{m^2}$, and the intenſity of the light of B at the ſame place $= \frac{y}{n^2}$, and as it is $\frac{x}{m^2} = \frac{y}{n^2}$ by the ſuppoſition, it will be $x : y :: m^2 : n^2$.

That the ſhadows being of equal denſity at any given point, the intenſities of the illuminating rays muſt of neceſſity be equal at that point alſo, is hence evident, that the total abſence of light being perfect blackneſs, and the ſhadow correſponding to one of the lights in queſtion being deeper or fainter, according as it is more or leſs enlightened by the other, when the ſhadows are equal, the intenſities of the illuminating rays muſt be equal likewiſe.

In removing the lights, in order to bring the ſhadows to be of the ſame denſity, care muſt be taken to recede from, or advance towards, the centre of the paper in a ſtraight line, ſo that the one light may always be found exactly in the line of reflection of the other; otherwiſe the rays from the different lights falling upon the paper, and conſequently upon the ſhadows, at different angles, will render the experiment fallacious.

When the intenſity of one ſtrong light is compared with the intenſities of ſeveral ſmaller lights taken together, the ſmaller lights ſhould be placed in a line perpendicular to a line drawn to the centre of the paper, and as near to each other as poſſible; and it is likewiſe neceſſary to place them at a greater diſtance from the paper than when only ſingle lights are compared.

In all caſes, it is abſolutely neceſſary to take the greateſt care that the lights compared be properly trimmed, and that they burn clear and equally, otherwiſe the

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(A) One of theſe was employed in the college of Glaſgow, by the lecturer on chemiſtry, ſo long ago as 1766.

the reſults of the experiments will be extremely irregular and inconcluſive. It is aſtoniſhing what a difference there is in the quantities of light emitted by the ſame candle, when it burns with its greateſt brilliancy, and when it has grown dim for want of ſnuffing. But as this diminution of light is progreſſive, and as the eye inſenſibly conforms to the quantity of light actually preſent, it is not always taken notice of by the ſpectators; it is nevertheleſs very conſiderable, in fact, as will be apparent to any one who will take the trouble to make the experiment; and ſo great is the fluctuation in the quantity of light emitted by burning bodies, lamps, or candles, in all caſes, even under the moſt favourable circumſtances, that this is the ſource of the greateſt difficulties which our author met with in determining the relative intenſities of lights by the method here propoſed.

To aſcertain by this method the comparative denſities, or intenſities, of the light of the moon and of that of a candle, the moon's direct rays muſt be received upon a plane white ſurface, at an angle of incidence of about 60°, and the candle placed in the line of the reflection of the moon's rays from this ſurface; when the ſhadows of the cylinder, correſponding to the moon's light and to that of the candle, being brought to be of equal denſity, by removing the candle farther off, or bringing it nearer to the centre of the white plane, as the occaſion may require, the intenſity of the moon's light will be equal to that of the candle *at the given diſtance of the candle from the plane.*

To aſcertain the intenſity of the light of the heavens, by day or by night, this light muſt be let into a darkened room through a long tube blackened on the inſide, when its intenſity may be compared with that of a candle or lamp by the method above deſcribed.

The Count, however, has contrived an apparatus for aſcertaining the intenſity of the ſun's light, compared with the light emitted by an artificial illuminator, with much greater accuracy than it can be done by this ſimple method. That apparatus we ſhall deſcribe under the title PHOTOMETER in this *Supplement;* and in the mean time we proceed to lay before our readers the reſults of his experiments as they relate to economy in the production of artificial light.

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Of the relative quantities of oil conſumed, and of light emitted, by an Argand's lamp, and by a lamp [illegible] com- [illegible] [illegible] ri- [illegible] [illegible]k.

The brilliancy of Argand's lamp is not only unrivalled, but the invention is in the higheſt degree ingenious, and the inſtrument uſeful for many purpoſes; but ſtill, to judge of its real merits, as an illuminator, it was neceſſary to know whether it gives more light than another lamp *in proportion to the oil conſumed.* This point he determined in the following manner:

Having placed an Argand's lamp, well trimmed, and burning with its greateſt brilliancy, before his *photometer*, and over againſt it a very excellent common lamp, with a riband wick about an inch wide, and which burnt with a clear, bright flame, without the leaſt appearance of ſmoke, he found the intenſities of the light emitted by the two lamps to be to each other as 17956 to 9063; the denſities of the ſhadows being equal when, the Argand's being placed at the diſtance of 134 inches, the common lamp was placed at the diſtance of 95,2 inches, from the field of the photometer.

Both lamps having been very exactly weighed when they were lighted, they were now (without being removed from their places before the photometer) cauſed to burn with the ſame brilliancy juſt 30 minutes; they were then extinguiſhed and weighed again, and were found to have conſumed of oil, the Argand's lamp $\frac{253}{8192}$, and the common lamp $\frac{163}{8192}$, of a Bavarian pound.

Now, as the quantity of light produced by the Argand's lamp, in this experiment, is to the quantity produced by the common lamp as 17956 to 9063, or as 187 to 100, while the quantity of oil conſumed by the former is to that conſumed by the latter only in the ratio of 253 to 163, or as 155 to 100, it is evident that the quantity of light produced by the combuſtion of a given quantity of oil in an Argand's lamp is greater than that produced by burning the ſame quantity in a common lamp, in the ratio of 187 to 155, or as 100 to 85.

The ſaving, therefore, of oil which ariſes from making uſe of an Argand's lamp inſtead of a common lamp, in the production of light, is evident; and it appears, from this experiment, that that ſaving cannot amount to leſs than fifteen *per cent.* How far the advantage of this ſaving may, under certain circumſtances, be counterbalanced by inconveniences that may attend the making uſe of this improved lamp, our author does not pretend to determine.

2
Of the relative quantities of light emitted by an Argand's lamp and by a common wax candle.

The Count made a conſiderable number of experiments to determine the relative quantities of light emitted by an Argand's lamp and a common wax candle; and the general reſult of them is, that a common Argand's lamp, burning with its uſual brightneſs, gives about as much light as nine good wax-candles; but the ſizes and qualities of candles are ſo various, and the light produced by the ſame candle ſo fluctuating, that it is very difficult to aſcertain, with any kind of preciſion, what a common wax-candle is, or how much light it ought to give. He once found that his Argand's lamp, when it was burning with its greateſt brilliancy, gave twelve times as much light as a good wax candle $\frac{7}{8}$ths of an inch in diameter, but never more.

3
Of the fluctuations of the light emitted by candles.

To determine to what the ordinary variations in the quantity of light emitted by a common wax-candle might amount, he took ſuch a candle, and, lighting it, placed it before the photometer, and over againſt it an Argand's lamp, which was burning with a very ſteady flame; and meaſuring the intenſity of the light emitted by the candle from time to time, during an hour, the candle being occaſionally ſnuffed when it appeared to ſtand in need of it, its light was found to vary from 100 to about 60. The light of a wax-candle of an inferior quality was ſtill more unequal; but even this was but trifling, compared to the inequalities of the light of a tallow-candle.

An ordinary tallow candle, of rather an inferior quality, having been juſt ſnuffed, and burning with its greateſt brilliancy, its light was as 100; in eleven minutes it was but 39; after eight minutes more had elapſed, its light was reduced to 23; and in ten minutes more, or twenty-nine minutes after it had been laſt ſnuffed, its light was reduced to 16. Upon being again ſnuffed, it recovered its original brilliancy, 100.

4
Of the relative quantities of bees-wax, tallow, olive-oil, rape-oil, and linſeed-oil, conſumed in the production of light.

In order to aſcertain the relative quantities of bees wax and of olive-oil conſumed, in the production of light, the Count proceeded in the following manner: Having provided an end of a wax-candle of the beſt quality, ,68 of an inch in diameter, and about four inches in length, and a lamp with five ſmall wicks, which he had found upon trial to give the ſame quantity of light as the candle, he weighed very exactly the candle and the lamp filled with oil, and then, placing them at equal diſtances (forty inches) before the field of the photometer, he lighted them both at the ſame time; and, after having cauſed them to burn with preciſely the ſame degree of brightneſs *juſt one complete hour*, he extinguiſhed them both, and, weighing them a ſecond time, he found that 100 parts of wax and 129 parts of oil had been conſumed.

Hence it appears, that the conſumption of bees wax is to the conſumption of olive-oil, in the production of the ſame given quantity of light, as 100 is to 129.

In this experiment no circumſtance was neglected that could tend to render the reſult of it concluſive; care was taken to ſnuff the candle very often with a pair of ſharp ſciſſars, in order to make it burn conſtantly with the ſame degree of brilliancy; and the light of the lamp was, during the whole time, kept in the moſt exact equilibrium with the light of the candle, which was eaſily done by occaſionally drawing out, a little more or leſs, one or more of its five equal wicks. Theſe wicks, which were placed in a right line, perpendicular to a line drawn from the middle of the field of the photometer, were about $\frac{1}{10}$th of an inch in diameter each, and $\frac{1}{4}$th of an inch from each other; and, when they were lighted, their flames united into one broad, thin, and very clear, white flame, without the leaſt appearance of ſmoke.

In order to aſcertain the relative conſumption of olive-oil and rape oil, in the production of light, two lamps, like that juſt deſcribed, were made uſe of; and, the experiment being made with all poſſible care, the conſumption of olive-oil appeared to be to that of rape-oil, in the production of the ſame quantity of light, as 129 is to 125.

The experiment being afterwards repeated with olive-oil and very pure linſeed-oil, the conſumption of olive-oil appeared to be to that of linſeed oil as 129 to 120.

The experiment being twice made with olive-oil and with a tallow-candle; once when the candle, by being often ſnuffed, was made to burn conſtantly with the greateſt poſſible brilliancy, and once when it was ſuffered to burn the whole time with a very dim light, owing to the want of ſnuffing; the reſults of theſe experiments were very remarkable.

When the candle burnt with a clear, bright flame, the conſumption of the olive-oil was to the conſumption of the tallow as 129 is to 101; but when the candle burnt with a dim light, the conſumption of the olive-oil was to the conſumption of the tallow as 129 is to 229. So that it appeared, from this laſt experiment, that the tallow, inſtead of being nearly as productive of light in its combuſtion as bees wax, as it appeared to be when the candle was kept conſtantly well ſnuffed, was now, when the candle was ſuffered to burn with a dim light, by far leſs ſo than oil.

But this is not all; what is ſtill more extraordinary is, that the very ſame candle, burning with a long wick, and a dim light, actually conſumed *more tallow* than when, being properly ſnuffed, it burnt with a clear, bright flame, and gave near *three times as much light*.

To be enabled to judge of the relative quantities of light actually produced by the candle in the two experiments, it will ſuffice to know, that in order to counterbalance this light at the field of the *photometer*, it required, in the former experiment, the conſumption of 141 parts, but in the latter only the conſumption of 64 parts, of olive-oil. But in the former experiment 110, and in the latter 114, parts of tallow were actually found to be conſumed. Theſe parts were 8192ths of a Bavarian pound.

From the reſults of all the foregoing experiments, it appears that the relative expence of the undermentioned inflammable ſubſtances, in the production of light, is as follows:

		Equal Parts in Weight.
Bees wax.	A good wax-candle, kept well ſnuffed, and burning with a clear, bright flame, . . .	100
Tallow.	A good tallow candle, kept well ſnuffed, and burning with a bright flame, ...	101
	The ſame tallow-candle, burning very dim for want of ſnuffing,	229
Olive-oil.	Burnt in an Argand's lamp, . .	110
	The ſame burnt in a common lamp, with a clear, bright flame, without ſmoke, ...	129
Rape-oil.	Burnt in the ſame manner, . .	125
Linſeed-oil.	Likewiſe burnt in the ſame manner, ...	120

With the foregoing table, and the prices current of the therein mentioned articles, the relative prices of light produced by thoſe different materials may very readily be computed.

In the year 1795, Mr J. H. Haſſenfratz was employed by the French government to make a ſeries of experiments to determine the moſt economical method of procuring light from the different combuſtible ſubſtances uſually employed for that purpoſe. The materials of his experiments were, wax, ſpermaceti, and tallow candles, fiſh-oil, oil of coleſeed, and of poppy-ſeeds. In uſing theſe oils, both the Argand and common lamps were employed. The wicks of the latter were round, containing thirty-ſix cotton threads. The tallow and ſpermaceti candles were mould, ſix to the pound. The wax candles five to the pound. Mr Haſſenfratz uſed the ſame method with Count Rumford for determining the comparative intenſity of the lights.

Count Rumford, as we have ſeen, uſed the Argand lamp as a ſtandard for compariſon; but as the intenſity of its light varies according to the height of the wick, Mr Haſſenfratz preferred a wax-candle, making uſe of it ſoon after it was lighted. When two luminous bodies, of different intenſities, are put in compariſon with each other, the ſhadows are of two colours. That from the weakeſt light is blue, and from the ſtrongeſt, red. When the lights of two different combuſtible bodies are compared, they are either red or blue in a compound ratio of the colour and intenſity. Thus in comparing the ſhadows from different luminous bodies, they will be red or blue reſpectively, in the following order:

Light of the ſun.
——— of the moon.
——— of Argand lamps.
——— of tallow-candles.
——— of wax ditto.

—— of ſpermaceti ditto.
—— of common lamps.

That is to ſay, when a body is illuminated by the ſun and by any other luminous ſubſtance, the ſhadow of the former is red, and of the latter, blue. In like manner, the ſhadow from an Argand lamp is red, when placed by that of a tallow candle, which is blue.

The following table will ſhew, according to Mr Haſſenfratz, the proportional diſtance that different luminous bodies ſhould be placed at to produce an equally intenſe ſhadow from the ſame object. The ſecond column gives the proportional intenſity of each light, which is known to be in proportion to the ſquares of the diſtances of luminous bodies giving the ſame depth of ſhadow. The third column ſhews the quantity of combuſtible matter conſumed in the hour by each mode of giving light, which Mr Haſſenfratz calculates from the average of many repeated experiments.

		Diſtance.	Intenſity.	Quantity conſumed per hour.	Quantity required for equal intenſities.
Argand lamps with	Oil of poppy-ſeed	10	10.000	23	23
	— of fiſhes	10	10.000	23.77	23.77
	— of cole-ſeed	9 246	8.549	14.18	16.59
Common lamps with	Oil of cole-ſeed	6.774	4.588	8.81	19.2
	— of fiſhes	6 524	4.556	9.14	20 06
	— of poppy-ſeed	5.917	3.501	7.05	20.14
Spermaceti candle		5.917	3.501	9.23	26.37
Old tallow-candle		5 473	2.995	7.54	25.17
New ditto		5 473	2.995	8.23	27.48
Wax candle		4.275	1.827	9.54	53

The relative quantity of combuſtible matter required to produce *equal* lights at equal diſtances, may be obtained by a ſimple rule of proportion from the above data. Thus, if a given intenſity of light, expreſſed by 3.501, has been produced by a conſumption of 9.23 of ſpermaceti in the hour, the ſame luminous body will produce a light of 10.000, by conſuming in the ſame time a quantity of ſpermaceti $= \frac{10.000 \times 9.23}{3.501} = 26.37$.— Therefore we may add to the table a fourth column, expreſſing the quantity of combuſtible which each body muſt conſume to produce a light of 10.000.

From what has been laid down, it will alſo appear that the number of lights required to produce a given light, will be as follows: To produce a light equal to 100 Argand lamps, burning poppy-ſeed oil, it will require

100 Argand lamps with fiſh-oil
117 Ditto do. with cole-ſeed oil
218 Common lamps with cole ſeed oil
219 Ditto do. with fiſh-oil
285 Ditto do. with poppy-ſeed oil
285 Spermaceti candles
333 Tallow ditto
546 Wax ditto.

Mr Haſſenfratz next takes notice of the comparative price of theſe articles; by which he finds, that in Paris the moſt expenſive light is that produced from wax-candles; and the moſt *economical*, that from oil of cole-ſeed, burned in Argand lamps.

The chief difference between the Argand and common lamp is, that in the latter much of the oil is volatilized without combuſtion, and hence the unpleaſant ſmell which it produces; whereas in the former, the heat is ſo great at the top of the wick, that all the oil is decompoſed in paſſing through, the diſpoſition of the wick allowing the free acceſs of air to aſſiſt combuſtion. It ſhould therefore follow, that the Argand lamp conſumes leſs fuel to produce a given light than the common lamp, and this, as we have ſeen, is the opinion of Count Rumford. Yet (Mr Haſſenfratz obſerves) there are two circumſtances that prevent the full effect of the complete combuſtion in the Argand lamp. The one is, that the glaſs cylinder abſorbs a part of the rays of light as they paſs through; the other, that the column of light proceeding from the inner ſurface of the wick, is, in part, loſt, by being obliged to paſs through that from the outer ſurface. Count Rumford allows the firſt cauſe of diminution of light, and eſtimates it at .1854, but not the latter. The author of this memoir, in repeating Count Rumford's experiments, aſſerts, that when two candles are placed ſo that the light of the one is obliged to paſs through that of the other, the ſum of the light ſo produced is not ſo ſtrong as when they are placed ſide by ſide; for in the firſt caſe, a part of the hindmoſt light is abſorbed by the foremoſt.

LAMPA, a juriſdiction of Cuſco, in Peru, in S. America. It begins about 30 leagues ſouth of the city of Cuſco; and is the principal province included under the name of Callao. Here are excellent paſtures and ſilver mines. The air is very cold.—*Morse.*

LAMPETER, a townſhip in Lancaſter county, Pennſylvania.—*ib.*

LANCASHIRE. In the account which we have given of that county in the *Encyclopædia*, an obliging correſpondent has pointed out to us ſome miſtakes. He aſſures us, that the ſea coaſt, where we underſtood the atmoſphere to be loaded with ſuch exhalations as produce malignant and intermitting fevers, is remarkably healthy; and he ſpeaks from experience, having lived on that coaſt for forty years. He aſſures us likewiſe, that the Duke of Bridgewater's inland navigation was begun ſoon after, if not before, the year 1736, and that he (the writer), ſo early as 1764, was one of a party who ſailed up the ſough or edit a conſiderable way to ſee how the coals were worked. The ſame correſpondent has pointed out a few miſtakes in our account of

LANCASTER, the capital of the county. "That town (he ſays) carries on no trade whatever with North America, but a very conſiderable one with Jamaica and the other Weſt India iſlands, in veſſels of from 100 to 500 tons burthen. It exports to theſe iſlands all ſuch Britiſh manufactures as they have occaſion for, Iriſh linens, and ſalted proviſions of all kinds, ſuch as Iriſh beef, pork, butter, &c. It trades alſo to the Baltic, Portugal, Hamburgh, &c. to a large amount; and ſome of its ſhips with their cargoes have of late been worth from L.60 to L.80,000 ſterling. It has, however, no communication by water with the rivers Merſey, Dee, &c. as we have ſaid; the canal reaching as yet no farther than to near Preſton in Lancaſhire." The communication with theſe rivers is indeed intended to be completed; but whether the ſcheme be practicable is, according to our correſpondent, very uncertain.

Lancaster, a bay or ſound on the weſtern coaſt of Sir Thomas Smith's bay. The ſouthernmoſt part lies in N. lat. 74° 20′. The moſt northerly is called Alderman Jonas's Sound, and lies in N. lat. 76°.—*Morse.*

Lancaster, a populous and wealthy county in the interior part of Pennſylvania, extending ſouth to the Maryland line. It is about 42 miles ſquare, is divided into 25 townſhips, and contains 566,240 acres of land, and 36,147 inhabitants, including 348 ſlaves. The lands in this county are rich and well cultivated. The hills in the northern parts abound with iron ore; for the manufacturing which, 2 furnaces and 8 forges have been erected. The furnaces manufacture about 1,200 tons of pigs and nearly that number of bar-iron annually. Copper and lead have alſo been found here. Chief town, *Lancaſter.*—*ib.*

Lancaster, a county of Virginia, bounded eaſt by Cheſapeak Bay, and S. W. by Rappahannock river. It is about 40 miles long, and 15 broad, and contains 5,638 inhabitants, of whom 3,336 are ſlaves.—*ib.*

Lancaster, a county of Camden diſtrict, S. Carolina, lying on Lynche's creek, and Wateree river. It contains 6,302 inhabitants, of whom 4,684 are whites, and 1,370 ſlaves.—*ib.*

Lancaster, a poſt-town of S. Carolina, 36 miles from Camden, and 47 from Charlotte, N. Carolina. —*ib.*

Lancaster, a very pleaſant poſt-town in Worceſter county, Maſſachuſetts, the oldeſt in the county, having been ſettled in 1645, and incorporated in 1653. It is ſituated in a branch of Naſhua river, which empties into the Merrimack. It is 35 miles W. N. W. of Boſton, 4 miles W. of Bolton, and 14 N. by E. of Worceſter. The lands of the townſhip of Lancaſter, and thoſe of Sterling on the S. W. are part of the tract called *Naſhawogg* by the Indians. The pleaſantneſs of this town has invited many perſons of education and fortune to reſide here. In the N. eaſterly part of Lancaſter, there is a valuable, and perhaps inexhauſtible ſlate pit, furniſhing ſlates for houſes, and excellent ſtones for tombs and graves. No ſlates equal to theſe have yet been diſcovered in the United States. Theſe are ſent to Boſton, and exported to New-York, Virginia, &c. Two principal branches of Naſhua river, over which are 9 large bridges, water this town, and have on their banks excellent intervale land. Cumberry pond in this town is obſerved to riſe as much as two feet, juſt before a ſtorm; and Sandy pond riſes in a dry ſeaſon.—*ib.*

Lancaster, a townſhip in Grafton county, New-Hampſhire, on the eaſt bank of Connecticut river, about 41 miles above Hanover. It was incorporated in 1763. In 1775 it contained 61 inhabitants, and in 1790—161.—*ib.*

LANCE ISLES, on the N. W. coaſt of N. America, lie off Cape Scott, which is the ſouthern point at the mouth of Pintard's Sound, oppoſite to Point Diſappointment. There is a narrow channel between the largeſt iſle and the cape.—*ib.*

LANDAFF, a townſhip in Grafton county, New-Hampſhire. It was incorporated in 1774, and contains 292 inhabitants.—*ib.*

LAND'S HEIGHT, in North America, is the high ground on the chain of lakes between Lake la Plue and Lake Superior, where there is a portage of 7 miles. It is 80 miles eaſt of the grand portage from the weſt end of Lake Superior.—*ib.*

LANGDON, a townſhip in Cheſhire county, New-Hampſhire, incorporated in 1787, and contains 244 inhabitants.—*ib.*

LANESBOROUGH, a townſhip in Berkſhire county, Maſſachuſetts, N. by E. of Hancock, 12 miles N. by W. of Lenox, and 144 W. by N. of Boſton. It affords a quarry of good marble, and contains 2,142 inhabitants.—*ib.*

LANSINBURGH, *(city)* in the townſhip of Troy, Renſſalaer county, New-York, is very pleaſantly ſituated on the E. bank of Hudſon's river, oppoſite one of the mouths of the Mohawk, and contains about 200 dwelling houſes, a brick church, the joint property of the Dutch and Preſbyterian congregation, a court-houſe, gaol, and an academy, incorporated in 1796. Here is a library company which was incorporated in 1775. It is a very flouriſhing place, ſituated on a plain at the foot of a hill, from the top of which is a moſt delightful proſpect. A few years ago there was but one ſtage between this town and Albany; now (1796) 20 ſtages daily paſs and repaſs between the neighbouring towns of Lanſinburgh, Troy, Waterford, and Albany; and the average number of paſſengers is ſaid to exceed 150. It is 9 miles north of Albany, 3 above Troy, 175 north of New-York, and 270 N. N. E. of Philadelphia.—*ib.*

LANTERN (See *Encycl.*). Sir George Staunton informs us, that of the Chineſe lanterns, ſome were ſuch as we have deſcribed, *viz.* compoſed of thin ſilk gauze, painted or wrought in needle-work with figures of birds, inſects, flowers, or fruit, and ſtretched on neat frames of wood. Others, however, were very different, being entirely made of horn. Theſe were ſo thin and tranſparent, that they were taken at firſt for glaſs; a material to which, for this purpoſe, the horn is preferred by the Chineſe, as cheaper, lighter, leſs liable to accident, and, in caſe of accident, more eaſily repaired; many of them were about two feet in the diameter, and in the form of a cylinder, with the ends rounded off, and the edges meeting in the point to which the ſuſpending cords were tied. Each lantern conſiſted of an uniform piece of horn, the joints, or ſeams, being rendered inviſible by an art found out by the Chineſe; among whom, the vaſt number of ſuch lanterns uſed in their dwelling houſes and temples, as well as on the occaſions of their feſtivals and proceſſions, have led to many trials for improving their conſtruction. The horns generally employed are thoſe of ſheep and goats. The uſual method of managing them, according to the information obtained upon the ſpot, is to bend them by immerſion in boiling water, after which they are cut open and flattened; they then eaſily ſcale, or are ſeparated into two or three thin laminæ or plates. In order that theſe plates ſhould be made to join, they are expoſed to the penetrating effect of ſteam, by which they are rendered almoſt perfectly ſoft. In this ſtate the edges of the pieces to be joined are carefully ſcraped and ſlanted off, ſo as that the pieces overlapping each other ſhall not together exceed the thickneſs of the plate in any other part. By applying the edges, thus prepared, immediately to each other, and preſſing them with pincers, they intimately adhere, and incorporating, form one ſubſtance, ſimilar in every reſpect to the other parts; and thus uniform pieces of horn may be prepared to almoſt any extent. It is a contrivance little known elſewhere, however ſimple the proceſs appears to be; and perhaps ſome minute precautions are omitted in the general deſcription, which may be eſſential to its complete ſucceſs.

Such lanterns as theſe would be very proper for military ſtore houſes; and Rochon of *the National Inſtitute* was employed, ſince the commencement of the preſent war, to make them, if he could, for the marine ſtorehouſes of France. While he was thus engaged, however, it occurred to him, that he might ſupply the preſſing wants of the navy without horn, merely by filling up the interſtices of wire-cloth with fine tranſparent glue. In carrying this thought into execution, he at firſt tinned the iron wires of the ſieve cloth he made uſe of; but afterwards found it more convenient, in every reſpect, to give it a ſlight coating of oil paint to preſerve it from ruſt. The glue he made uſe of was afforded by boiling the clippings of parchment with the air-bladders and membranes of ſea fiſh; materials which he uſed, not from any notion that they were preferable to iſinglaſs, but becauſe they were the cheapeſt he could procure. He added the juice of garlic and cyder to his compoſition, in ſuch proportions as he found to communicate great tenacity, and ſomewhat more of tranſparence than it would have poſſeſſed without them. Into this tranſparent and very pure glue or ſize he plunged his wire cloth, which came out with its interſtices filled with the compound. It is requiſite that the ſize ſhould poſſeſs a determinate heat and conſiſtence, concerning which experience alone muſt guide the operator.

When this prepared wire cloth is fixed in the lantern, it muſt be defended from moiſture by a coating of pure drying linſeed oil; but even in this ſtate it is not fit to be expoſed to the weather. The eaſe with which theſe lanterns are repaired in caſe of accident, by a ſlight coating of glue, is pointed out as a great advantage by the inventor; who likewiſe informs us, that they were uſed in the expedition to Ireland as ſignal lanterns, though contrary to his wiſhes.

LAPIS FUNGIFER, a ſpecies of earth found near Rome, Naples, and Florence, of which the following account is taken from the *New Tranſactions of the Royal Academy of Sciences at Stockholm* for the year 1797: Near Naples the lapis fungifer is found in the chalk-hills like a white ſtalactites, intermixed with a great many fine roots of ſhrubs; and near Florence there is a ſpecies of it, conſiſting of hardened turf, which is dug up near volcanoes. The author made experiments with a piece procured from Italy, and found that 100 parts contain from 45 to 46 ſiliceous earth, 23 argillaceous earth, 7 calcareous earth, and 20 calx of iron, with ſome white magneſia and vegetable alkali. It is well known, that when this friable ſpecies of ſtone is preſerved in cellars and moiſtened with water, it produces abundance of eatable muſhrooms, which in Italy are highly eſteemed and brought to the firſt tables. Hence the origin of its name.

LAPIS LAZULI, a ſmall rock ſurrounded with and almoſt covered by the ſea on the coaſt of Nova-Scotia. It is about 2 miles from Monano Iſland, and ſhews the paſſage into St John's river.—*Morſe*.

LARDIZABALA, a new genus of plants belonging to the *diœcia hexandria* of Linnæus. It is a native of Chili, and is thus deſcribed in Perouſe's Voyage, from drawings ſent to France by La Martiniere. The leaves are alternate, on footſtalks inflated at their baſe. Each leaf is bi-ternate, that is to ſay, it is divided into three leaflets, each of which is again ſubdivided into three oval ſharp-pointed folioles, which, when young, are entire, but afterwards become obſcurely lobed. The flowers, diſpoſed in ſimple and pendent cluſters, grow towards the top of the ſtem and of the branches in the axillæ of the leaves. The plant is diœcious. At the baſe of each cluſter of bloſſoms are two ſmall, rounded, oval, floral leaves.

MALE FLOWER.—*Calyx* formed of ſix expanding leaves, oblong oval, and obtuſe, of which the three outermoſt are the largeſt. *Corolla* compoſed of ſix ſharp lanceolated petals, oppoſite to, and ſhorter than, the leaves of the calyx. A cylinder riſes from the centre of the flower of the length of the petals, terminated by ſix oblong bilocular anthers, which open from below.

FEMALE FLOWER.—*Calyx*, ſimilar to that of the male flower, but larger. *Corolla* inſerted beneath the piſtil, compoſed of ſix petals, rarely entire, but generally bifid or trifid at their ſummit: ſhorter than the leaves of the calyx. *Stamina* ſix, having the ſame inſertion as the corolla; filaments diſtinct, broad, very ſhort, ſurrounding the piſtil; *anthers*, ſix, upright, oblong, acuminated, barren. *Seed bud*, cells, from three to ſix, oblong, gibbous on the outſide, of nearly the length of the corolla; ſtyles none; ſtigmata, ſitting, oblong, permanent. *Berries*, equal in number to the cells, oblong, acuminated (divided into ſix cells, containing ſeveral angular ſeeds. *Flora Peruviana).*

The general character of the lardizabala evidently places this new genus among the family of the *meniſpermæ*, to which it is related by its climbing ſtalk, its bunches of diœcious flowers, by its ſix petals, ſtamina, and leaves of its calyx, by its piſtil, compoſed of from three to ſix cells, which contain as many ſeeds. It differs from the known genera of this order only in its fruit, which, inſtead of being monoſpermous, contains ſeveral ſeeds. This character, which requires the introduction of a new ſection into the *meniſpermæ*, ſtrengthens the relation of this family to the next order of the *anonæ*. In fact, the greater part of the genera of the anonæ, as they have in the ſame flower ſeveral fruits, with numerous ſeeds, differ in this particular from all the genera of the meniſpermæ; and by placing between them the lardizabala, we eſtabliſh a natural tranſition. In order to confirm theſe reſemblances, it only remains to examine the inſide of the fruit, and particularly the ſtructure of the ſeeds. Thoſe of the meniſpermæ are reniform, at leaſt on the inſide, incloſed in a hinged pericarpium, and containing in their upper part a very ſmall dicotyledonus embryo. The characters that we have given of the lardizabala render probable a ſimilar ſtructure in its ſeeds.

LARGE ROCK lies on the S. bank of Ohio river, in the tract called Indiana, and nearly oppoſite the mouth of Muſkingum river.—*Morse.*

LARGE ISLAND, one of the largeſt iſlands on the Labrador coaſt, due weſt of the mouth of Shecatica Bay.—*ib.*

LARICAXAS, a province of La Paz, and audience of Charcas, in Peru. It lies adjacent to the territories of the juriſdiction of La Paz, and to the north of that city, extending 118 leagues from E. to W. and about 30 from N. to S. It abounds in gold mines, the metal of which is of ſo fine a quality, that its ſtandard is 23 carats and 3 grains.—*ib.*

LARMIER, in architecture, a flat ſquare member of the cornice below the cimaſium, and jets out fartheſt; being ſo called from its uſe, which is to diſperſe the water, and cauſe it to fall at a diſtance from the wall, drop by drop, or, as it were, by tears; *larme* in French ſignifying a tear.

LATACUNGA, *Aſſiento of*, the firſt juriſdiction to the ſouthward of that of Quito, in Peru. The word *aſſiento* implies a place leſs than a town, but larger than a village. It ſtands on a wide plain, having on its eaſt ſide the eaſtern cordillera of the Andes, from which projects a very high mountain; and at a ſmall diſtance from its foot is ſituated Latacunga, in 55° 14′ 30″ S. lat. On its W. ſide is a river, which is ſometimes fordable, but generally paſſed over a bridge. This aſſiento is large and regular, the ſtreets broad and ſtraight, the houſes of ſtone, arched, and well contrived, one ſtory high. This precaution the inhabitants were taught to obſerve by a dreadful deſtruction of all the buildings, on the 20th of June, 1699. Out of 600 ſtone houſes, which the aſſiento then contained, only a part of one, and the Jeſuit's church, were left ſtanding, and moſt of the inhabitants were buried in the ruins. The ſtone of which the houſes and churches are built, is a kind of pumice, or ſpongy ſtone, ejected from volcanoes; which have formed inexhauſtible quarries in the neighbourhood. It is ſo light, that it will ſwim in the water, and from its great poroſity, the lime cements the different pieces very ſtrongly together. This juriſdiction contains 17 principal villages. The air of the aſſiento is colder from the place being only 6 leagues from the mountain of Cotopaxi; which as it is not leſs in height or extent than thoſe of Chimborazo and Caymburo, ſo, like them, it is covered with ice and ſnow. The villages are populous; ſuch as are ſeated in the vallies are hot, thoſe in the plains temperate, whilſt thoſe which border on the mountains, like that of the aſſiento, are cold, and ſometimes to an exceſſive degree. The inhabitants amount to about 12,000, chiefly Spaniards and Meſtizoes. Great quantities of pork are ſalted here and ſent to Quito, Guayaquil, and Riobamba, being highly valued for the peculiar flavour given it in the pickling. The manufactures are thoſe of cloth, bays, and tucuyos. The inhabitants of Pugili, and Saquiſili, are noted for making earthen-ware, highly valued all over the province of Quito. The clay of which they are made is of a lively red, remarkably fine, emitting a kind of fragrancy, and the workmanſhip very neat and ingenious.—*Morse.*

LATUS PRIMARIUM, a right line drawn through the vertex of the ſection of a cone, within the ſame, and parallel to the baſe.

LATUS Rectum. See *CONIC Section*, Encycl.

LATUS Tranſverſum of the hyperbola, is the right line between the vertices of the two oppoſite ſections, or that part of their common axis lying between the two oppoſite cones.

LAUREL MOUNTAIN, a range of mountains weſtward of the Alleghany ridge, and a part of what is called the Alleghany Mountains. It extends from Pennſylvania to N. Carolina, and gives riſe to ſeveral branches of the Ohio river. The Great Kanhaway breaks through the Laurel Ridge in its way to the Ohio, in N. lat. 38° 30′, W. long. 81° 19′. In a ſpur of this mountain, about latitude 36°, is a ſpring of water, 50 feet deep, very cold, and, it is ſaid, as blue as indigo. The lands within a ſmall diſtance of the Laurel Mountain, through which the Youghiogany runs, are in many places broken and ſtoney, but rich and well timbered; and in ſome places, and particularly on Laurel Creek, they are rocky and mountainous. From the Laurel Mountain to Monongahela, the firſt 7 miles are good, level, farming lands, with fine meadows; the timber, white-oak, cheſnut, hickory, &c.—*Morse.*

LAURENS, a county in Ninety-Six diſtrict, S. Carolina, lying between Enoree and Saluda rivers. It is about 31 miles long, and 22 broad, and contains 8,217 free inhabitants, and 1,120 ſlaves.—*ib.*

LAURENT *of the Mine, St*, a ſettlement in the iſland of St Domingo, near the Spaniſh capital, St Domingo. It ſtands in the place where the capital was firſt founded, on the eaſt ſide of the Ozama, and about a quarter of a league from its confluence with the Iſabella. It can only be conſidered as a dependency on St Domingo, and contains 300 inhabitants, all free negroes, forming a cure. It was formed in 1723, by 128 run-away French negroes who being ſent down to the bay of Ocoa to be ſhipped off, the Spaniards attacked the eſcort, and gave arms to the fugitives, maintaining that they were free men.—*ib.*

LAVA. In addition to the obſervations of Sir William Hamilton, Bergmann, Formes, and Dalmieu, on the compoſition of different lavas, which have been given in the *Encyclopædia*, we cannot refuſe ourſelves the pleaſure of noticing, in this place, thoſe of Sir James Hall. From a number of well-deviſed experiments, Sir James thinks himſelf warranted to conclude, that lava and whinſtone are intrinſically the ſame ſubſtance; and that their apparent differences ariſe wholly from the circumſtances under which they have paſſed from a liquid to a ſolid ſtate. The lavas, it is well known, have been cooled rapidly in the open air, and the whins (according to Dr Hutton's theory, which Sir James ſeems willing to adopt) ſlowly in the bowels of the earth.

Though we are far from adopting that theory in all its parts, to which we think inſuperable objections may be made (ſee EARTH, *Encycl.* n° 120), we admit, that the experiments of Sir James Hall go far to eſtabliſh the identity of lava and whinſtone. Theſe experiments were made upon ſeven different ſpecies of whinſtone and ſix lavas, of which four were broken from the currents of Etna and Veſuvius by Sir James himſelf. Each of the original whinſtones was reduced, by fuſion and ſubſequent rapid cooling, to a ſtate of perfect glaſs. This glaſs, being again placed in the furnace, was ſubjected to a ſecond fuſion. The heat, being then reduced to a temperature generally about 28° of Wedgewood, was maintained ſtationary for ſome hours; when the crucible was either immediately removed, or allowed to cool with the furnace. The conſequence was, that in every caſe the ſubſtance had loſt the character of glaſs, and by cryſtallization had aſſumed in all reſpects that of an original whinſtone. It muſt be owned, that in moſt caſes the new production did not exactly reſemble the particular original from which it was formed, but ſome other original of the ſame claſs; owing to accidental varieties in the mode of refrigeration, and to chemical changes which unavoidably took place during the proceſs. In the caſe, however, of the rock of Edinburgh caſtle, and of that of the baſaltic columns of Staffa, the artificial ſubſtances bear a complete reſemblance to their originals, both in colour and texture.

The lavas were now treated in the ſame way, and were each, by fuſion and rapid cooling, reduced, as the whinſtones had been, to glaſs. This glaſs, when fuſed again and cooled ſlowly, yielded the ſame kind of cryſtallized, ſtony, or earthy maſſes, completely reſembling an original whin or lava.

Although the internal ſtructure of lava was thus accounted for, yet Sir James was embarraſſed with the ſtate of its external ſurface; which, though cooled in contact with the open air, is ſeldom or never vitreous, holding an intermediate ſtation between glaſs and ſtone; but this difficulty was removed by a circumſtance which took place in the courſe of theſe experiments. It was found, that a ſmall piece of glaſs of any of the lavas, or of ſeveral of the whins, being introduced into a muffle, the temperature of which was at any point between the 20th and the 22d degree of Wedgewood's ſcale, the glaſs became quite ſoft in the ſpace of one minute; but, being allowed to remain till the end of a ſecond minute, it was found to have become hard throughout in conſequence of a rapid cryſtallization, to have loſt its character of glaſs, and to have become by 12 or 14 degrees more infuſible, being unaffected by any heat under 30, though the glaſs had been fuſible at 18° or at 16°. This accounted for the ſcoria on the ſurface of lavas; for the ſubſtance even at the ſurface, being in contact with the flowing ſtream, and ſurrounded with heated air, could not cool with exceſſive rapidity: and the experiment ſhews, that ſhould any part of the maſs, in deſcending heat, employ more than one or two minutes in cooling from 22 to 20, it would infallibly loſe its vitreous character.

Independently of any alluſion to ſyſtem or to general theory, Sir James Hall flatters himſelf that theſe experiments may be of ſome importance, by ſimplifying the hiſtory of volcanoes; and, above all, by ſuperſeding ſome very extraordinary, and, he conceives, unphiloſophical opinions advanced with regard to volcanic heat, which has been ſtated as poſſeſſing very little intenſity, and as acting by ſome occult and inconceivable influence, or with the help of ſome inviſible agent, ſo as to produce liquidity without fuſion. Theſe ſuppoſitions, which have been maintained ſeriouſly by ſome of the moſt celebrated naturaliſts in Europe, have originated from the difficulty of accounting for the ſtony character of lavas when compared with that of glaſs, which they aſſume in conſequence of fuſion in our furnaces. But now he hopes we may be relieved from the neceſſity of ſuch violent efforts of imagination, ſince the phenomena have been fully accounted for by the ſimple, though unnoticed, principle of refrigeration, and have been repeated again and again with eaſe and certainty in a ſmall chamber furnace.

LAVOISIER (Antoine Laurent), was born in Paris on the 26th of Auguſt 1743. His father, who directed his education, was opulent, and ſpared no coſt for his improvement. The youth ſhewed a decided taſte for the phyſical ſciences. In 1764, government having propoſed an extraordinary premium for the beſt and cheapeſt mode of lighting the ſtreets of a large city, Lavoiſier obtained the gold medal; and his memoir, full of nice inveſtigation, was printed by the Academy. Into that body he was received on the 13th May 1768, in ſpite of a formidable oppoſition; and to its ſervice he ever after devoted his labours, and became one of its moſt uſeful aſſociates and coadjutors.

His attention was ſucceſſively occupied with every branch of phyſical and mathematical ſcience. The pretended converſion of water into earth, the analyſis of gypſum in the neighbourhood of Paris, the cryſtallization of ſalts, the effects produced by the *grande de loupe* of the garden of the Infanta, the project of bringing water from l'Yvette to Paris, the congelation of water, and the phenomena of thunder and the aurora borealis—all occupied his attention.

Journeys, undertaken in concert with Guettard into every diſtrict of France, enabled him to procure numberleſs materials towards a deſcription of the lithological and mineralogical empire; theſe he arranged into a kind of chart, which wanted little of being completed. They ſerved alſo as a foundation for a more laborious work of his on the revolutions of the globe, and the formation of *Couches de la Terre;* a work of which two beautiful ſketches are to be ſeen in the Memoirs of the French Academy for 1772 and 1787. All the fortune and all the time of Lavoiſier were devoted to the culture of the ſciences; nor did he ſeem to have a preponderating inclination for any one in particular, until an event, ſuch as ſeldom occurs in the annals of the human mind, decided his choice, and attached him thenceforth excluſively to chemiſtry—a purſuit which has ſince rendered his name immortal.

The important diſcovery of gaſes was juſt announced to the philoſophical world. Black, Prieſtley, Scheele, Cavendiſh, and Macbride, had opened to phyſiologiſts a ſort of new creation; they had commenced a new era in the annals of genius, which was to become equally memorable with thoſe of the compaſs, printing, electricity, &c.

It was about the year 1770 that Lavoiſier, ſtruck with the importance and grandeur of this diſcovery, turned his attention to this inexhauſtible fountain of truths, and inſtantly perceived, by a kind of inſtinct, the glorious career which lay before him, and the influence which this new ſcience would neceſſarily have over the whole train of phyſical reſearches. Of thoſe who had preceded him, the moſt indefatigable experimenter was Prieſtley: but facts the moſt brilliant remained frequently unproductive in his hands; he was often ready to draw certain concluſions which as haſtily he abandoned.

ed. Lavoiſier was imbued with the true ſpirit of inductive philoſophy; his obſervations, eminently preciſe and luminous, always pointed to general views. In 1774, he publiſhed his chemical opuſcules, which contained a very neat hiſtory of all that had been done with reſpect to gaſes, and concluded with the author's capital experiments, by which it was proved, that metals, in calcination, derive their augmentation of weight from the abſorption of air. Soon afterward, he ſhewed, in oppoſition to Prieſtley, that nitrous acid is compoſed of air; a remark, of which the importance appeared in the ſequel. His ingenuity as a chemiſt was now ſo well known, that in 1776 Turgot employed him to inſpect the manufacture of gun-powder. He introduced ſome valuable improvements, and, ſuppreſſing the odious viſits in queſt of the materials of ſaltpetre, he yet quintupled its produce. The gun-powder would now carry 120 toiſes, when formerly it would not reach 90. This ſuperiority was indeed acknowledged in the laſt war.

It had been alleged, that by frequent diſtillation water is converted into earth. This queſtion Lavoiſier reſolved in 1778, having ſhewn that the earthy ſediment was owing to the continual eroſion of the internal ſurface of the retort. In that ſame year he made a more intereſting diſcovery; namely, that the reſpirable portion of the atmoſphere is a conſtituent principle of all acids, and which he therefore denominated *oxygen*; a moſt important fact, and the firſt great ſtep towards the new chemiſtry; which the compoſition of water, aſcertained in 1783, triumphantly completed.

Lavoiſier poſſeſſed deciſive advantages over his contemporaries; he ſtudied a geometrical accuracy of inveſtigation; and his wealth enabled him to make experiments on a large ſcale, and to uſe inſtruments of the moſt perfect conſtruction. He was able to hold in his houſe, twice every week, aſſemblies, to which he invited every literary character that was moſt celebrated in geometrical, phyſical, and chemical, ſtudies; in theſe inſtructive *converſationes*, diſcuſſions, not unlike ſuch as preceded the firſt eſtabliſhment of academies, regularly took place. Here the opinions of the moſt eminent literati in Europe were canvaſſed; paſſages the moſt ſtriking and novel, out of foreign writers, were recited and animadverted on; and theories were compared with experiments. Here learned men of all nations found eaſy admiſſion; Prieſtley, Fontana, Blagden, Ingenhouſz, Landriani, Jacquin, Watt, Bolton, and other illuſtrious phyſiologiſts and chemiſts of England, Germany, and Italy, found themſelves mixed in the ſame company with La Place, La Grange, Borda, Couſin, Meunier, Vandermonde, Monge, Morveau, and Berthollet. Happy hours paſſed in theſe learned interviews, wherein no ſubject was left uninveſtigated that could poſſibly contribute to the progreſs of the ſciences, and the amelioration and happineſs of man. One of the greateſt benefits reſulting from theſe aſſemblages, and the influence of which was ſoon afterwards felt in the academy itſelf, and conſequently in all the phyſical and chemical works that have been publiſhed for the laſt twenty years in France, was the agreement eſtabliſhed in the methods of reaſoning between the natural philoſophers and the geometricians. The preciſion, the ſeverity of ſtyle, the philoſophical method of the latter, was inſenſibly tranſfuſed into the minds of the former; the philoſophers became diſciplined in the tactics of the geometricians, and were gradually moulded into their reſemblance.

It was in the aſſemblage of theſe talents that Lavoiſier embelliſhed and improved his own. When any new reſult from ſome important experiment preſented itſelf, a reſult which threatened to influence the whole theory of the ſcience, or which contradicted theories till then adopted, he repeated it before this ſelect ſociety. Many times ſucceſſively he invited the ſevereſt objections of his critical friends; and it was not till after he had ſurmounted their objections, to the conviction and entire perſuaſion of the ſociety; it was not till after he had removed from it all myſtery and obſcurity, that he ventured to announce to the world any diſcovery of his own.

At length he combined his philoſophical views into a conſiſtent body, which he publiſhed in 1789, under the title of *Elements of Chemiſtry*; a book which is a moſt beautiful model of ſcientific compoſition, clear, logical, and elegant. It would be foreign to our purpoſe to attempt an expoſition of the principles, or to expatiate on the merits, of this celebrated ſyſtem; which, within the ſpace of a very few years, has been almoſt univerſally adopted, and which, if not the genuine interpretation of nature, approaches as near to it as the preſent ſtate of knowledge will permit. See CHEMISTRY in this *Supplement*.

The laſt, but not the leaſt uſeful, of Lavoiſier's philoſophical reſearches, on the Perſpiration of Animals, was read to the Academy on the 4th May 1791, and of which part was publiſhed in the volume for 1790. He found, by ſome delicate experiments, made in conjunction with Seguin, that a man in 24 hours perſpires 45 ounces; that he conſumes 33 ounces of vital air; that he diſcharges from the lungs 8 cubic feet of carbonic acid gas, of which one-third is carbon and two-thirds are oxygen; that the weight of water diſcharged from the lungs amounts to 23 ounces, of which 3 are hydrogen and 20 oxygen, excluſive of 6 ounces of water already formed, loſt in pulmonary perſpiration. Theſe diſcoveries were directed to the improvement of medicine.

We have mentioned the aſſiſtance which Lavoiſier received while he was digeſting his new ſyſtem of chemiſtry; but we muſt add, that to him pertains excluſively the honour of a founder. His own genius was his ſole conductor, and the talents of his aſſociates were chiefly uſeful in illuſtrating diſcoveries he himſelf had made; he firſt traced the plan of the revolution he had been a long time conceiving; and his colleagues had only to purſue and execute his ideas.

In the twenty volumes of the Academy of Sciences, from 1772 to 1793, are 40 memoirs of Lavoiſier, replete with all the grand phenomena of the ſcience; the doctrine of combuſtion general and particular; the nature and analyſis of atmoſpherical air; the formation and fixation of elaſtic fluids; the properties of the matter of heat; the compoſition of acids; the augmentation of the ponderoſity of burnt bodies; the decompoſition and recompoſition of water; the diſſolution of metals; vegetation, fermentation, and animalization. For more than 15 years conſecutive, Lavoiſier purſued, with unſhaken conſtancy, the route he had marked out for himſelf, without making a ſingle falſe ſtep, or ſuffering his ardour to be damped by the numerous and increaſing obſtacles which conſtantly beſet him.

Many were the ſervices rendered by Lavoiſier, in a public and private capacity, to manufactures, to the ſciences, and to artiſts. He was treaſurer to the Academy after Buffon and Tillet, and introduced economy and order into the accounts. He was alſo a member of the Board of Conſultation, and took an active ſhare in whatever was going forwards. When the new ſyſtem of meaſures was agitated, and it was propoſed to determine a degree of the meridian, he made accurate experiments on the expanſion of metals, and conſtructed a metalline thermometer. By the National Convention he was conſulted on the means of improving the manufacture of aſſignats, and of increaſing the difficulties of forging them.

Like a good citizen, Lavoiſier turned his thoughts to political economy. Between the years 1778 and 1785, he allotted 240 *arpents* in the Vendômois to experimental agriculture, and increaſed the uſual produce by one-half. In 1791, he was invited by the Conſtituent Aſſembly to digeſt a plan for ſimplifying the collection of the taxes. This gave occaſion to an excellent report, afterwards printed with the title of *Territorial Riches of France*. At this time, alſo, he was appointed commiſſioner of the national treaſury, in which he effected ſome beneficial reforms.

During the horrors of the Robeſpierrean dictatorſhip, Lavoiſier told La Lande that he foreſaw he ſhould be ſtripped of his property, but that he would work for his bread. The profeſſion of apothecary would have ſuited him the beſt. But his doom was already fixed. On the 8th of May 1794, confounded with 28 farmers general, he ſuffered on the ſcaffold, merely becauſe he was rich!

Lavoiſier was tall, and of a graceful, ſprightly appearance. He was mild, ſociable, obliging, and extremely active; and in his manners he was unaffectedly plain and ſimple. Many young men, not bleſſed with the gifts of fortune, but incited by their genius to woo the ſciences, have confeſſed their obligations to him for pecuniary aid; many, alſo, were the unfortunate whom he relieved in ſilence, and without the oſtentation of virtue. In the communes of the department of the *Loir* and *Char*, where he poſſeſſed conſiderable eſtates, he would frequently viſit the cottages of indigence and diſtreſs; and long will his memory be cheriſhed there. But his reputation, influence, virtues, and wealth, gave him a great preponderance, which unfortunately provoked the jealouſy of a crew of homicides, who made a ſport of ſacrificing the lives of the beſt of men to a ſanguinary idol.

This great and good man married, in 1771, Marie-Anni-Pierette Paulze, daughter of a farmer-general; a woman whoſe wit and accompliſhments conſtituted the charm of his life; who aſſiſted him in his labours, and even engraved the figures of his laſt work.

LAWRENCE, *Fort*, is a little above the croſſing place of Tuſcarawas, a branch of Muſkingum river. —*Morſe*.

LAWRENCE-TOWN, a thinly ſettled agricultural townſhip, a few miles to the eaſtward of Halifax in Nova-Scotia.—*ib*.

LAWUNAK-HANNOCK, a Moravian ſettlement nearly oppoſite Goſhgoſhink, on Alleghany river, and 20 miles north-eaſt of Fort Franklin.—*ib*.

LEACOCK, a townſhip in Lancaſter county, Pennſylvania.—*ib*.

LEAD. See that article (*Encycl.*), and CHEMISTRY-*Index* in this *Supplement*. It is well known, that lead generally contains a portion of ſilver, and ſometimes of gold; and that there are occaſions, particularly in aſſaying, when it is of importance to have it freed from theſe metals. For accompliſhing theſe purpoſes different proceſſes have been propoſed; but the following by Pet. Jac. Hjelm, as it is the leaſt expenſive, promiſes to be the moſt uſeful:

LITHARGE (ſee *Encycl.*) was the ſubſtance on which this chemiſt made his experiments, and his principal object was to free it from all mixture of ſilver. This was accompliſhed in the following manner: He placed a crucible, in which half a pound of litharge found good room, and which was fitted with a cloſe cover, in a wind-furnace filled with dead coals. He then put into the crucible a mixture of four ounces of potaſh and the ſame quantity of powder of flint. When the whole was well melted by ſtrengthening the draught, and making the coals glow, he took off the cover, and laid hold of the crucible with a pair of tongs, in order to take it out, and to ſuffer this very fuſible glaſs to cover the inſide of the crucible, to ſecure it from the glaſs of the lead which he meant to melt in it. The ſuperfluous glaſs was poured out; the crucible again placed on its foot, and half a pound of litharge thrown into it with a ſhovel. The cover was placed upon it while the litharge was melting; and when it was thoroughly glowing and fluid, charcoal duſt was ſifted into the uncovered crucible through a ſieve, ſo that the ſurface of the litharge was completely covered with it. This immediately produced an effervеſcence, and the riſing of bubbles, by means of the ſeparation of the air occaſioned by the reduction of the lead. During this proceſs, the cover was put on, and a few coals thrown into the furnace: when theſe were burnt, every thing in the crucible was quiet, and the melted maſs was poured into a warm conical mould. The crucible was then again filled with half a pound of the ſame kind of litharge, and put into the furnace, and charcoal duſt was ſeveral times ſifted over the melted ſurface, till it was well covered before the maſs was thrown out, a ſufficient ſpace being every time left for the effervеſcence. The firſt maſs had, in the mean time, become cool, and, on examination, contained four ounces of lead at the bottom, and litharge at the top. When this litharge was reduced with potaſhes and wine ſtone, the lead thence obtained, which weighed 23 ounces, was found to contain leſs than one-half grain of ſilver in the pound. In the ſecond maſs there was found ſomewhat more than ſix ounces of lead, which contained all the ſilver that had been before mixed with the litharge, becauſe in the lead which had been reduced from the litharge in the above manner, there were no perceptible traces of ſilver. This lead was then melted over a ſlow fire, and caſt into bars, which were rolled ſmooth, and formed into maſſes of a known weight, to be uſed for aſſaying gold and ſilver, and for other purpoſes of the ſame kind. All theſe meltings were made in one crucible, which, according to every appearance, remained unhurt. If the ſame experiments were made with red lead, the like reſult would infallibly follow.

With the ſame view of obtaining lead free from ſilver, he melted, in the like manner, half a pound of white lead, which produced half an ounce of lead. When the litharge ſtanding over it was revived, the lead obtained was ſtill found to contain too much ſilver. He therefore precipitated another half pound of white lead by charcoal powder, after the lead that fell from it had been ſeparated; and then it produced, by reviving, a maſs of lead without any mixture of ſilver.

LEASBURGH, the chief town of Caſwell county, N. Carolina. It contains a court-houſe, gaol, and a few houſes.—*Morſe*.

LEBANON, a townſhip in York county, Diſtrict of Maine, ſituated on the eaſt ſide of Salmon Fall river, 100 miles north of Boſton. It was incorporated in 1767, and contains 1275 inhabitants. A ſpecies of ſtone is found here which yields copperas and ſulphur.—*ib.*

LEBANON, *New*, a pleaſant village in New-York State, bordering on Pittsfield, Maſſachuſetts, ſituated partly in a vale, and partly on the declivity of hills. The medicinal ſprings here are next in celebrity to thoſe of Saratoga. The pool is ſituated on a commanding eminence, overlooking the valley, and ſurrounded with a few houſes which afford tolerable accommodations to invalids.—*ib.*

LEBANON, a townſhip in Windham county, Connecticut, was ſettled in 1697. The ſoil is equal to almoſt any in the State, and the inhabitants are generally farmers, many of whom are wealthy. The thick ſettled part of the town forms a very wide ſtreet, and the houſes are at conſiderable diſtances from each other. Academic education has been patronized in this place for above 80 years, greatly to the honour of the people. The river Shetucket is formed by the junction of Willamantic and Mount Hope rivers, which unite between this town and Windham. It lies 9 miles north of Norwich, and 30 ſouth-eaſt of Hartford.—*ib.*

LEBANON, a townſhip in Grafton county, New-Hampſhire, ſituated on Muſcomy river, and on the eaſt ſide of the Connecticut, 2 miles below Dartmouth College. It was incorporated in 1761. In 1775 it contained 347 inhabitants, and in 1790—1180. It is in contemplation to build a bridge on Connecticut river at the middle bar of Agar's falls in this town, where the diſtance between the rocks is 110 feet. It is 35 miles above the bridge built by Col. Hale at Bellows's Falls at Walpole.—*ib.*

LEBANON, a poſt-town of Pennſylvania, ſituated on the ſouth ſide of Quitipahilla creek, in Dauphin county. About a mile from the town is the Suſquehannah, and Schuylkill canal, which connects this creek with the Tulpehocken, a branch of the Schuylkill. Lebanon contains about 300 houſes, regularly built, many of which are of brick and ſtone; a German Lutheran and a Calviniſt church. It is 25 miles E. by N. of Harriſburg, 43 E. by S. of Carliſle, and 82 N. W. by W. of Philadelphia.—*ib.*

LEDYARD (—— ——), the celebrated, though unfortunate, traveller, was a native of North America, but of what province we have not learned. We are equally ignorant of the year of his birth, and the rank of his parents; but have no reaſon to think that they were opulent. From his early youth he diſplayed a ſtrong propenſity to viſit unknown and ſavage countries; and to gratify that propenſity, he lived for ſeveral years with the American Indians, whoſe manners and habits he ſeemed in ſome degree to have acquired. Afterwards he ſailed round the world with Captain Cook in the humble ſtation of a corporal of marines; and on his return, he determined to traverſe the vaſt continent of America, from the Pacific to the Atlantic Ocean.

This deſign being fruſtrated by his not obtaining a paſſage to Nootka Sound, he determined to travel over land to Kamſchatka. With this view he went over to Oſtend, with only ten guineas in his pocket, and proceeded by the way of Denmark and the Sound to the capital of Sweden, and endeavoured to croſs the Gulph of Bothnia on the ice; but finding, when he came to the middle, that the water was not frozen, he walked round the gulph to Peterſburgh. Here he found himſelf without ſtockings or ſhoes; but procured relief from the Portugueſe ambaſſador, and obtained leave to proceed with a detachment of ſtores to Yakutz. He made this journey of ſix thouſand miles, and there met Mr Billengs, an Engliſhman, whom he had known on board Captain Cook's ſhip. From thence he went to Oczakow, on the coaſt of the Kamſchatka Sea; but being too late to embark that year, returned to Yakutz to winter. Here he was, on ſome ſuſpicion, ſeized, conveyed on a ſledge through Northern Tartary, and left on the frontiers of the Poliſh dominions. In the midſt of poverty, rags, and diſeaſe, he however reached Koningſburg, where he found friends that enabled him to reach England.

On his arrival in London, he waited on Sir Joſeph Banks, on whoſe credit he had, in his diſtreſs, received at different times 25 guineas. Sir Joſeph communicated to him the views of the African Aſſociation, and pointed out the route in which they wiſhed Africa to be explored. On his engaging at once in the enterpriſe, Sir Joſeph aſked him when he would be able to ſet out. “To-morrow morning,” replied Ledyard, without heſitation. At this interview the preſident of the Royal Society declares, that he was ſtruck with the figure of the man, the breadth of his cheſt, the openneſs of his countenance, and the rolling of his eye. Though ſcarcely exceeding the middle ſize, his figure indicated great ſtrength and activity. Deſpiſing the accidental diſtinctions of ſociety, he ſeemed to regard no man as his ſuperior; but his manners, though coarſe, were not diſagreeable. His uncultivated genius was original and comprehenſive. From the native energy of his mind, he was adventurous, curious, and unappalled by dangers; while the ſtrength of his judgment united caution with energy. The track pointed out to him was from Cairo to Senaar, and thence weſtward in the latitude and ſuppoſed direction of the Niger.

He was not ignorant, that the taſk aſſigned him was arduous and big with danger; but inſtead of ſhrinking from it, he ſaid, on the day of his departure, “I am accuſtomed to hardſhips; I have known both hunger and nakedneſs to the utmoſt extremity of human ſuffering; I have known what it is to have food given me as charity to a madman; and I have at times been obliged to ſhelter myſelf under the miſeries of that character to avoid a heavier calamity. My diſtreſſes have been greater than I ever owned, or ever will own to any man. Such evils are terrible to bear, but they never yet had power

Ledyard.

Ledyard, ‖ Leeds.

to turn me from my purpoſe. If I live, I will faithfully perform, in its utmoſt extent, my engagement to the Society: and if I periſh in the attempt, my honour will be ſafe; for death cancels all bonds."

After receiving his inſtructions and letters of recommendation, this intrepid traveller ſailed from London on the 30th of June 1788; and in 36 days arrived at Alexandria. Proceeding to Cairo, where he arrived Auguſt the 17th, he viſited the ſlave markets, and converſed with the travelling merchants of the caravans. Theſe ſources of information, generally neglected by travellers, enabled him to obtain, at a very ſmall expence, more correct information concerning the African nations and their trade, the poſition of places, the nature of the country, the manner of travelling, &c. than could have been eaſily obtained by any other method. He thus learned, that the Arabs of the deſert have an invincible attachment to liberty, though it is ſingular that they have no word to expreſs liberty in their language. The Mahomedans of Africa are a trading, ſuperſtitious, and warlike ſet of vagabonds. He ſaw near 200 black ſlaves expoſed to ſale, who had been brought from the interior parts of Africa; their appearance ſavage, but not like priſoners of war; they had head ornaments, and their hair plaited in detached plaits of great length. Another parcel, which had come from Darfoor, were moſtly women; and the beads, and ſome other ornaments which they wore, were Venetian. They were well formed, quite black, had the true Guinea face, and curled hair. Mr Ledyard was informed, that the king of Senaar was a merchant, and concerned in the caravans; that 20,000 negro ſlaves are imported into Egypt annually. Among ſome Senaar ſlaves, he ſaw three of a bright olive colour, but their heads uncommonly formed, the forehead the narroweſt, longeſt, and moſt protuberant he ever ſaw.

The Senaar caravan is the moſt rich; that of Darfoor is not equally ſo, though it trades with almoſt the ſame commodities. Beſides ſlaves, theſe are gum, elephants teeth, camels, and oſtrich-feathers; for which are received in exchange trinkets, ſoap, antimony, red linen, razors, ſciſſars, mirrors, and beads. Wangara, to which the caravans alſo trade, was repreſented to Mr Ledyard as a kingdom producing much gold; but the king ſeems to intermeddle with commerce as well as the potentate of Senaar; for in order to deceive ſtrangers, and prevent them from gueſſing at the extent of his riches, he was reported to vary continually the gold uſed in barter, which it is his province to regulate, and of which he iſſues at one time a great quantity, and at others little or none. A caravan goes from Cairo to Fezzan, which they call a journey of fifty days; and as the caravans travel about 20 miles a day, the diſtance muſt be about 1000 miles; from Fezzan to Tombuctoo is 1800 miles; from Cairo to Senaar about 600 miles.

Such was the information which Mr Ledyard derived from the merchants of the caravans in Egypt; but when he was about to verify it by his own obſervations, and had announced to the Aſſociation that his next diſpatch would be dated from Senaar, he was ſeized with a bilious complaint, which fruſtrated the ſkill of the moſt eminent phyſicians, and put a period to his travels and his life at Cairo. It is needleſs to ſay how much his death was regretted, or how well he was qualified for the arduous enterpriſe in which he had engaged. The perſon who, with ſuch ſcanty funds, could penetrate the frozen regions of Tartary, ſubſiſt among their churliſh inhabitants, and ingratiate himſelf with the ferocious Moors of Egypt, could hardly have failed to obtain a kind reception from the gentle and hoſpitable Negro, had no untoward circumſtance intervened. At Senaar, indeed, his riſk would have been great; and Mr Bruce was decidedly of opinion, that a man ſo poorly attended as Mr Ledyard, could never have made his eſcape from that treacherous and ferocious people.

The obſervations of this accurate obſerver on the female character, though they have been repeatedly quoted in other works, are well intitled to a place here; and with them we ſhall conclude this ſketch of his life: "I have always (ſays he) remarked, that women in all countries are civil and obliging, tender and humane; that they are ever inclined to be gay and cheerful, timorous and modeſt; and that they do not heſitate, like man, to perform a generous action. Not haughty, not arrogant, not ſupercilious; they are full of courteſy, and fond of ſociety; more liable, in general, to err than man; but in general alſo more virtuous, and performing more good actions than he. To a woman, whether civilized or ſavage, I never addreſſed myſelf, in the language of decency and friendſhip, without receiving a decent and friendly anſwer. With man it has often been otherwiſe. In wandering over the barren plains of inhoſpitable Denmark, through honeſt Sweden, and frozen Lapland, rude and churliſh Finland, unprincipled Ruſſia, and the wide ſpread regions of the wandering Tartar; if hungry, dry, cold, wet, or ſick, the women have ever been friendly to me, and uniformly ſo. And to add to this virtue (ſo worthy the appellation of benevolence), theſe actions have been performed in ſo free and kind a manner, that if I was dry, I drank the ſweeteſt draught; and if hungry, I eat the coarſeſt morſel with a double reliſh." For a fuller account of *Ledyard*, ſee *The Tranſactions of the African Aſſociation*, or *A View of the Late Diſcoveries in Africa.*

LEE, a ſmall town in Strafford county, New-Hampſhire, about 12 miles north of Exeter. It was formerly part of Dover and Durham, and was incorporated in 1766. In 1775 it contained 954 inhabitants, in 1790—1029.—*ib.*

Lee, *Fort*, was erected by the Americans during the late war, on the weſt bank of North river, having the tract called the Engliſh Neighbourhood on the north, and that called Heboken on the ſouthward, in N. lat. 40° 56′, and about 9 miles above the town of Bergen. The Americans had 2,000 men in garriſon here in the late war, but evacuated it in November, 1776, with the loſs of their artillery and ſtores.—*ib.*

Lee, a county of Virginia, lately taken from Ruſſel, in the S. W. corner of the State, bounded ſouth by the State of N. Carolina, and weſt by Kentucky.—*ib.*

Lee, a townſhip in Berkſhire county, Maſſachuſetts, 5 miles ſoutherly of Lenox, 4 eaſt of Stockbridge, and 140 weſt of Boſton; was incorporated in 1777, and contains 1,170 inhabitants. Houſatonick river runs ſoutherly through this town.—*ib.*

LEEDS, a town in the eaſtern part of Glouceſter county, New-Jerſey, 4 miles weſt of the mouth of Mullicus river, and 8 north-weſterly of Brigantine Inlet.—*ib.*

Leeds, a village of Richmond county, Virginia, ſituated on the north bank of Rappahannock river; 14 miles E. by S. of Port-Royal, 40 S. E. of Frederickſburg, and 70 N. E. of Richmond. Near Leedſtown is a famous courſe for horſe-racing.—*ib.*

LEEFOOGA, one of the Friendly iſlands, in the South Sea. It was viſited by Captain Cook in 1776, who conſiders it, in ſome reſpects, ſuperior to Anamooka. The iſland is ſituated near Hapaee, and is about 7 miles long and 3 broad.—*ib.*

LEESBURGH, a poſt-town of Maryland, 25 miles from Frederickſtown.—*ib.*

Leesburg, a poſt-town of Virginia, and capital of Loudon county. It is ſituated 6 miles S. W. of the Patowmac, and 4 ſouth of Gooſe Creek, a branch of that river on the great road leading from Philadelphia to the ſouthward, and on the leading road from Alexandria to Bath. It contains about 60 houſes, a court-houſe, and gaol. It is 20 miles from Saliſbury, 32 from Shepherdſtown, 20 miles from Frederickſtown in Maryland, 46 north-weſt of Alexandria, and 64 E. S. E. of Wincheſter.—*ib.*

Leesburg, or *Leeſtown*, a ſettlement in Kentucky, on the banks of Kentucky river, 20 miles from Lexington, and about 30 from the Upper Blue Lick. It was deſtroyed by the Indians and abandoned. The country for many miles round is firſt rate land. Great plenty of marble is found on the banks of Kentucky, particularly at this place.—*ib.*

LEE'S ISLAND, in Patowmac river, in Fairfax county, Virginia, about 2 miles ſouth-eaſtward of Thorp, which is on the north ſide of Gooſe Creek.—*ib.*

LEEK, a ſmall iſland of Pennſylvania, in Delaware river.—*ib.*

Hyperbolic LEGS, are the ends of a curve line that partakes of the nature of the hyperbola, or having aſymptots.

LEHIGH, or *Lecha*, a river which riſes in Northampton county, Pennſylvania, about 21 miles eaſt of Wyoming Falls, in Suſquehannah river, and taking a circular courſe, paſſing through the Blue Mountains, empties into Delaware river on the ſouth ſide of Eaſton, 11 miles N. E. of Bethlehem. It runs about 75 miles, and is navigable 30 miles.—*Morſe.*

LE GRAND, a conſiderable river of the N. W. Territory, which riſes within a few miles of the weſt extremity of Lake Erie, and purſuing a N. N. W. courſe for nearly 100 miles, thence turning to the weſt, empties into Lake Michigan. It is about 250 yards wide at its confluence with the lake.—*ib.*

LEICESTER, a townſhip in Addiſon county, Vermont, ſituated on the eaſt ſide of Otter Creek, having 343 inhabitants. Great Trout Pond, or Lake, is partly in this town, and partly in Saliſbury, on the north. This town was granted Oct. 20, 1761.—*ib.*

Leicester, called by the Indian natives *Towtaid*, is a conſiderable town in Worceſter county, Maſſachuſetts, containing 1076 inhabitants. It is ſituated upon the poſt-road from Boſton to Hartford, New-York and Philadelphia, 6 miles weſterly of Worceſter, and 54 W. by S. of Boſton; bounded N. by Paxton and S. by Oxford. It was ſettled in 1713, and incorporated in 1720 or 1721. There are three meeting-houſes here for Congregationaliſts, Anabaptiſts, and Quakers; who live in harmony together. The *Leiceſter Academy* was incorporated in 1784, and is well endowed. Wool cards are manufactured here to the annual amount of 15,000 pairs.—*ib.*

LEMINGTON Priors, is a village two miles eaſt of the town of Warwick, famous for its mineral waters. One ſalt ſpring, which riſes near the church yard, has been long known, as well as another which riſes in the bed of the river; but the moſt remarkable ſpring was diſcovered in the year 1790. The waters of both ſprings have been analyzed with great accuracy by William Lambe, M. A. late Fellow of St John's colledge, Cambridge, who has given us the following ſynoptical table of the ſubſtances contained in them:

Gaſeous Fluids contained in a Wine-gallon in Cubic Inches.

	WATER OF THE NEW SPRING.	WATER OF THE OLD SPRING.
Hepatic gas -	*Too ſmall to be meaſured.*	*Too ſmall to be meaſured.*
Azotic gas -	3.5	3
Carbonic acid gas	.5	—

Solid contents of a Wine-gallon in Grains.

	WATER OF THE NEW SPRING.	WATER OF THE OLD SPRING.
Carbonat of iron	.75	
Oxyds of iron and mangaueſe -	—	*Too ſmall to be weighed.*
Oxygenated muriat of iron and manganeſe - -	*Unknown, but very ſmall.*	*Unknown, but very ſmall.*
Sulphur - - -	*Unknown, but very ſmall.*	—
Muriat of magneſia	11.5	58
Muriat of ſoda	430	330
Sulphat of ſoda	152	62
Sulphat of lime	112	146

In the courſe of his experiments, for which we muſt refer to the original memoir, in Tranſactions of the Mancheſter Society, Mr Lambe thinks he diſcovered the origin of the *muriatic acid.* He found a coincidence, very unexpected, between the hepatiſed ſolution of iron and the oxygenated muriat of iron. "I had almoſt concluded (ſays he), from the reſemblance between the properties of this ſalt and the phenomena of the water, that the water contains this very ſalt. Now, I conclude, that they contain a matter, be it what it may, produced by the action of hepatic gas on iron. But they are the very ſame facts which form the baſis, upon which each ſeparate inference is built. Does it not follow, then, as a neceſſary conſequence, that the hepatiſed ſolution itſelf contains a muriat of iron highly oxygenated, and that therefore *in this proceſs muriatic acid is generated?* This concluſion ſeemed authoriſed by reaſon, and experiment has confirmed it."

Lemington, a townſhip in Eſſex county, Vermont, on the weſt bank of Connecticut river, and near the N. E. corner of the State. The Great Monadnock mountain is in this town. It contains 31 inhabitants.—*ib.*

LEMNISCATE, the name of a curve in the form of the figure of 8.

LEMON-juice, is an article of ſuch harmleſs luxury, and in ſome caſes of ſuch real utility, that many of our readers will be pleaſed to know a ſimple method by which they may obtain it in great purity. In the article CHEMISTRY (*Suppl.*), n° 476, we have ſhewn from Scheele and Dizé, how to obtain the citric acid perfectly pure, and in the form of cryſtals; but here we mean nothing more than to ſhew how it may be completely ſeparated from that ſlimy ſubſtance with which it is always mixed in the lemon, without allowing it time to ſpoil or to acquire any diſagreeable taſte during the ſeparation. This we are enabled to do by M. Brugnatelli, who, in the 2d volume of the *Annali di Chimia*, informs us, that he expreſſed in the common manner the juice of perfectly ripe lemons, and ſtrained it through a piece of linen. In half an hour he ſtrained it again, to free it from a little ſlimy matter which had ſettled at the bottom of the veſſel. He then added to the juice a certain quantity of the ſtrongeſt ſpirit of wine, and preſerved the mixture for ſome days in a well-corked bottle. During that time there was a conſiderable depoſit, which to all appearance was of a ſlimy nature, and which he ſeparated by filtering paper. If the fluid was too thick to paſs through the filter, he diluted it again with ſpirit of wine. After this operation, the depoſit remained on the paper, which was entirely covered with it; and he obtained, in the veſſel placed below, the pureſt acid of lemons combined with ſpirit of wine.

If it be required to obtain the acid perfectly pure, nothing is neceſſary but to ſeparate from it the ſpirit of wine, which can be beſt effected by evaporation. The acid of the lemons aſſumes, after it has been freed from the ſpirit of wine and the moiſture combined with it, a yellowiſh colour, and becomes ſo ſtrong, that by its taſte it might be conſidered as a mineral acid.

It is not neceſſary to evaporate the ſpirit of wine in a cloſe veſſel, if the experiment is made only on a ſmall ſcale; nor is there any danger that in open veſſels any of the acid will be loſt, as it is too fixed to be volatiliſed by the ſame degree of heat at which ſpirit of wine evaporates. This acid has peculiar properties, which deſerve farther examination.

LEMPSTER, an inconſiderable townſhip in Cheſhire county, New-Hampſhire. It was incorporated in 1761. In 1775 it contained 128 and in 1790—414 inhabitants.—*Morse.*

LENOIR, a county of Newbern diſtrict, N. Carolina, ſurrounded by Glaſgow, Craven, Jones, and Dauphin. It contains 2,484 free inhabitants, and 957 ſlaves. Chief town, Kingſton.—*ib.*

LENOX, the ſhire town of Berkſhire county, Maſſachuſetts. It is a pleaſant and thriving town, and has a court-houſe and gaol. Houſatonick river paſſes through the town. It lies eaſt of Waſhington, ſouth of Pittsfield, 17 miles ſouth-weſterly of Cheſter, and 145 miles north of Boſton.—*ib.*

LENSES (ſee LENS and DIOPTRICS, *Encycl.*), are either blown or ground.

Blown LENSES are uſed only in the ſingle microſcope; and the uſual method of making them has been to draw out a fine thread of the ſoft white glaſs called *cryſtal*, and to convert the extremity of this into a ſpherule by melting it at the flame of a candle. But this glaſs contains lead, which is diſpoſed to become opake by partial reduction, unleſs the management be very carefully attended to. We are informed, however, by Mr Nicholſon, that the hard glaſs uſed for windows ſeldom fails to afford excellent ſpherules. This glaſs is of a clear bright green colour when ſeen edgewiſe. A thin piece was cut from the edge of a pane of glaſs leſs than one-tenth of an inch broad. This was held perpendicularly by the upper end, and the flame of a candle was directed upon it by the blow-pipe at the diſtance of about an inch from the lower end. The glaſs became ſoft, and the lower piece deſcended by its own weight to the diſtance of about two feet, where it remained ſuſpended by a thin thread of glaſs about one five-hundredth of an inch in diameter. A part of this thread was applied endwiſe to the lower blue part of the flame of the candle without the uſe of the blow-pipe. The extremity immediately became white-hot, and formed a globule. The glaſs was then gradually and regularly thruſt towards the flame, but never into it, until the globule was ſufficiently large. A number of theſe were made; and being afterwards examined, by viewing their focal images with a deep magnifier, proved very bright, perfect, and round. This, as the ingenious author obſerves, may prove an acceptable piece of information to thoſe eminent men (and there are many ſuch), whoſe narrow circumſtances, or remote ſituations, are obliged to have recourſe to their own ſkill and ingenuity for experimental implements.

Ground LENSES, are ſuch as are ground or rubbed into the deſired ſhape, and then poliſhed. Different ſhapes have been propoſed for lenſes; but in the article OPTICS, n° 251 (*Encycl.*), it has been ſhewn that, after all, the ſpherical is the moſt practically uſeful. By many of the methods of grinding, however, the artificer, with his utmoſt care, can only produce an approximation to a truly ſpherical figure; and, indeed, gentlemen have, for the moſt part, nothing to depend on for the ſphericity of the lenſes of their teleſcopes, but the care and integrity of the workmen. In the 41ſt volume of the Tranſactions of the Royal Society of London, a machine is deſcribed by Mr Samuel Jenkins, which, as it is contrived to turn a ſphere at one and the ſame time on two axes, cutting each other at right angles, will produce the ſegment of a true ſphere merely by turning round the wheels, and that without any care or ſkill in the workmen. The following deſcription of this machine will enable our readers fully to comprehend its conſtruction, and the mode of uſing it: A is a globe covered with cement, in which are fixed the pieces of glaſs to be ground. This globe is faſtened to the axis, and turns with the wheel B. C is the braſs cup which poliſhes the glaſs: this is faſtened to the axis, and turns with the wheel D. The motion of the cup C, therefore, is at right angles with the motion of the globe A; whence it follows, demonſtrably, that the pieces of glaſs ground by this double motion muſt be formed into the ſegments of ſpheres.

Plate XXXII.

LEO X. is a pontiff to whom learning, and art, and ſcience, are ſo deeply indebted, that not to give a ſketch of his life and character, in a Work of this kind, would be an unpardonable omiſſion. A character of him is indeed given in the *Encyclopædia*; but it is ſo far from the truth, that it is difficult to conceive the prejudices under which the writer muſt have laboured by whom it was drawn up.

Leo, whoſe name, before his elevation to the pontificate, was *Giovanni de Medici*, was the ſecond ſon of Lorenzo de Medici, juſtly ſtyled the Magnificent. In the life of that great man publiſhed in this *Supplement*, the reader will ſee by what means, and for what purpoſe, he got Giovanni raiſed to the dignity of cardinal at ſo early a period of life; and in the elegant work of Roſcoe, to which we there refer, he will find ſuch inſtructions of Lorenzo to the cardinal as muſt have made a deep impreſſion on his youthful mind.

Speaking of his promotion, Lorenzo ſays, "The firſt thing that I would ſuggeſt to you, is, that you ought to be grateful to God, and continually to recollect that it is not through your merits, your prudence, or your ſolicitude, that this event has taken place, but through his favour, which you can repay only by a *pious*, *chaſte*, and *exemplary life;* and that your obligations to the performance of theſe duties are ſo much the greater, as in your *early years* you have given ſome *reaſonable expectation* that your riper age may produce ſuch fruits. It would indeed be highly diſgraceful, and as contrary to your duty as to my *hopes*, if at a time when others diſplay a greater ſhare of reaſon, and adopt a better mode of life, you ſhould forget the *precepts of your youth*, and forſake the path in which you have *hitherto trodden*."—"I well know (continues Lorenzo), that as you are now to reſide at Rome, that ſink of all iniquity, the difficulty of conducting yourſelf by theſe admonitions will be increaſed. The influence of example is itſelf prevalent; but you will probably meet with thoſe, who will particularly endeavour to corrupt and incite you to vice; becauſe, as you yourſelf may perceive, your early attainment of ſo great a dignity is not obſerved without envy, and thoſe who could not prevent your receiving that honour, will ſecretly endeavour to diminiſh it, by inducing you to forfeit the good eſtimation of the public."—"You are not unacquainted with the great importance of the character which you have to ſuſtain; for you well know, that all the Chriſtian world would proſper if the cardinals were what they ought to be; becauſe in ſuch a caſe there would always be a good pope, upon which the tranquillity of Chriſtendom ſo materially depends."

As this was a confidential letter from Lorenzo to his ſon, the firſt of theſe extracts furniſhes very ſufficient evidence, that Giovanni had been at leaſt a well behaved boy, diligent in his ſtudies, and regular in his conduct; and without ſuppoſing him remarkably religious, the admonitions of ſuch a father, aided by his own ambition and love of letters, would ſurely guard him againſt ſuch groſs licentiouſneſs as that of which he is accuſed in the *Encyclopædia*. How much he revered his father, is apparent from the letter which he wrote to his brother immediately after Lorenzo's death. "What a father (ſays he) have we loſt! How indulgent to his children! Wonder not, then, that I grieve, that I lament, that I find no reſt. Yet, my brother, I have ſome conſolation in reflecting that I have thee, whom I ſhall always regard in the place of a father." Surely this is not the language of a groſs ſenſualiſt, or of one who could ſoon forget the ſalutary admonitions of ſuch a parent as Lorenzo de Medici. But it is needleſs to infer the decency of his character by ſuch reaſonings as theſe. The ſtory publiſhed in the *Encyclopædia*, of the manner in which the Cardinal de Medici obtained the tiara, cannot poſſibly be true. The reader, who ſhall turn to the article Pope in that Work, will find that the conclave, when fitted up for an election, is ſo large a place, that we may ſafely affirm, that had the cardinal's ulcer diſcharged matter ſo fetid as to *poiſon all the cells*, the aſſertion of the phyſicians would have been verified, and that in the then ſtate of the healing art, the new pope could not have ſurvived a month. Let it be remembered, too, that Leo, at his acceſſion, was not 30, but 37 years of age, and that he had long ruled in Florence with ſovereign ſway by the ſame means which had upheld the authority of his father. The follies of youth, therefore, had he ever been remarkable for ſuch follies, muſt have been over with him; and in ſuch a ſtate as Florence he could not have maintained the authority of Lorenzo, without exhibiting not only Lorenzo's liberality, but likewiſe his decency of manners.

The next charge brought againſt Leo in the *Encyclopædia* is, that he publiſhed general indulgences throughout Europe; and this is ſo expreſſed as to lead the ill-informed reader to ſuppoſe, either that no ſuch indulgences had ever been publiſhed by any of his predeceſſors, or that there was ſomething peculiarly ſcandalous in Leo's mode of publiſhing them. Both ſuppoſitions, however, are erroneous. The hiſtorian of the council of Trent, who certainly was not partial to the court of Rome, or to the diſpenſing power of the pope, has ſhewn, that the practice of raiſing money by the publication of indulgences, had prevailed ever ſince the year 1100; that many former popes had raiſed money in this manner for purpoſes much leſs laudable than thoſe which Leo had in his eye; and that the real cauſe of Luther's attack upon Leo's indulgences was, that they were preached through Saxony by the Dominican friars; whereas the preaching of former indulgences had been committed to the hermits of St Auguſtine, the order to which Luther himſelf belonged!

Leo is likewiſe accuſed in the *Encyclopædia* of being a profeſſed infidel, and of having called Chriſtianity "a fable very profitable for him and his predeceſſors." But of the truth of this accuſation there ſeems not to be the ſhadow of evidence. Leo had too much ſenſe to utter expreſſions of this kind, even had he been an unbeliever in his heart; for he could not poſſibly expect that his indulgences and pardons would be purchaſed, had he declared in ſuch ſtrong terms that they were of no value. Father Paul indeed ſays, that he was not a deep divine, or ſo pious as ſome of his predeceſſors; but he affirms, that he *adorned the papacy* with many admirable qualities; that he was learned, affable, liberal, *good;* that he delighted in healing differences, and that his equal had not, for many years, filled the chair of St Peter. Surely this is not the character of a profane infidel!

Leo has been charged with raiſing his own family to grandeur at the expence of juſtice; and of dealing treacherouſly in order to effect this purpoſe, both with the emperor and with the French king. But the charge is either falſe or greatly exaggerated. He loſt no opportunity indeed of aggrandizing his relations, well knowing, that in order to ſecure to them any laſting benefit, it was neceſſary that they ſhould be powerful enough to defend themſelves, after his death, from the rapacious aims of ſucceeding pontiffs; but, in proſecuting this plan, he was ſo far from acting tyrannically or injuriouſly to others, that during his pontificate, the papal dominions enjoyed a degree of tranquillity ſuperior to any other Italian ſtate. During the conteſts that took place between the emperor and the French king, ſo far from acting treacherouſly, he diſtinguiſhed himſelf by his moderation, his vigilance, and his political addreſs; on which account he is juſtly celebrated by an eminent hiſtorian of our own,* as "the only prince of the age who obſerved the motions of the two contending monarchs with a prudent attention, or who diſcovered a proper ſolicitude for the public ſafety."

We truſt that no zealous Proteſtant will think we have employed our time ill, in vindicating the character of this ſplendid pontiff; for good learning, and, of courſe, true religion, are more indebted to Leo X. than to any other individual of the age in which he lived, his father Lorenzo alone excepted.

Leo Minor, the *Little Lion*, a conſtellation of the northern hemiſphere, and one of the new ones that were formed out of what were left by the ancients, under the name of *Stellæ Informes*, or unformed ſtars. See Astronomy, n° 406, *Encycl.*

LEOGANE, *Bay of*, called alſo *Bight* or Bite of Leogane, alſo Cul de Sac of Leogane, at the weſt end of the iſland of St Domingo, is formed by two peninſulas. It opens between Cape St Nicholas at the weſt end of the north peninſula, and Cape Dame Marie, the N. W. point of the ſouth peninſula, 45 leagues apart. At the bottom of the bay are the iſlands Gonave, and on the north ſide of the ſouth peninſula the iſles Reſſif and Caymite. It emboſoms a vaſt number of fine bays. The chief bays, towns and ports from Cape St Nicholas round to Cape Dame Marie are La Plate Forme, or the Platform, Gonaives, St Marc, Montrouis, Archahaye, Port au Prince, Leogane, Goave, Miragoane, Petit Trou, Bay of Baradaires, Bay of Durot, Jeremie, Cape Dame Marie, &c. Trou Bordet, at the head of which is Port au Prince, is at the extremity of the Bay of Leogane eaſtward, 60 leagues E. of Cape Dame Marie, and 51 S. E. of Cape St Nicholas.—*Morse.*

Leogane, a ſea port town in the French part of the iſland of St Domingo, ſituated on the N. ſide of the neck of the ſouth peninſula in the bay or bite of Leogane, at the head of a ſmall bay which ſets up E. from the bay of Grand Goave, 4 leagues N. E. of the town of that name, 6½ N. of Jacmel, 8 N. W. of Cayes de Jacmel, 9 W. by S. of Port au Prince, and 6¼ leagues S. E. of Petite Gonave iſland. N. lat. 18° 30′, W. long. from Paris 75° 2′. It is an agreeable, pleaſant, and commercial place. The exports from Jan. 1, 1789 to Dec. 31, of the ſame year, were 95,871lbs. white ſugar—7,079,205lbs. brown ſugar—1,932,952lbs. coffee—139,887lbs. cotton—and 4,960lbs. indigo. The duties on the exportation of the above, 26,103 dollars 70 cents.—*ib.*

LEOMINSTER, a poſt-town in Worceſter county, Maſſachuſetts, 7 miles N. by W. of Lancaſter, 20 S. E. of Winchendon, 46 weſtward of Boſton, 19 N. of Worceſter, and 20 S. of Marlborough, in New-Hampſhire, has a printing-office and ſeveral neat buildings. This townſhip was taken from Lancaſter, incorporated in 1740, and contains 1189 inhabitants. On the different ſtreams which paſs through the town are 2 griſt-mills, 5 ſaw-mills, an oil-mill, and clothiers works, very excellent. About 200,000 bricks are annually made here. The manufacture of combs is alſo carried on to great perfection and profit. *Leominſter Gore*, adjoining, contains 27 inhabitants.—*ib.*

LEON, a river which falls into the Gulf of Mexico from the N. W. at the bay of St Bernard.—*ib.*

Leon, *New*, a populous kingdom of New-Spain, in N. America, in which are ſeveral ſilver mines.—*ib.*

Leon, a town of the province of Panuco, in Mexico. It has rich mines, and lies 30 leagues north of Mechoacan, and 55 N. W. of the city of Mexico.—*ib.*

Leon de Caracas, St, a city, the capital of the province of the Caracas, ſituated on a river, about 6 leagues ſouth from the coaſt, encloſed by mountains. The valley in which it ſtands is a ſavannah, well watered and very healthy, about 3 leagues long and 1 broad in the middle, the only entrance into which is through a crooked and ſteep road. The city is near a mile long; the houſes handſome and well furniſhed; the ſtreets regular, ſtraight and broad, cutting each other at right angles, and terminating in a magnificent ſquare in the centre. It contains about 4 or 5,000 inhabitants; moſt of whom are owners of cocoa plantations, which 12 or 13,000 negroes cultivate in the rich vallies, which is almoſt the only cultivation they have.—*ib.*

Leon de Nicaragua, a town of N. America in New-Spain, and in the province of Nicaragua; the reſidence of a governor, and a biſhop's ſee. It was taken by the buccaneers in 1685, in ſight of a Spaniſh army who were 6 to 1; is ſeated at the foot of a mountain which is a volcano, and occaſions earthquakes. It conſiſts of about 1000 houſes, and has ſeveral monaſteries and nunneries belonging to it. At one end of the town is a lake which ebbs and flows like the ſea. It is 30 miles from the South Sea. N. lat. 12° 25′, W. long. 88° 10′.—*ib.*

LEONARDSTOWN, a poſt-town of Maryland, and the capital of St Mary's county, is ſituated on the eaſt ſide of Britton's brook, juſt where it falls into Britton's bay, 5 miles from its mouth in the Patowmac, and contains about 50 houſes, a court-houſe, and gaol. It is 113 miles ſouth of Baltimore, 62 S. by E. of Upper Marlborough, 30 ſouth-eaſt of Port Tobacco, and 217 ſouth-weſt of Philadelphia. N. lat. 38° 18′.—*ib.*

LEPERS' *Iſland*, one of the *New Hebrides*. The inhabitants of this iſland, according to Bougainville's account of them, "are of two colours, black and mulatto. Their lips are thick, their hair frizzled, and ſome have a kind of yellow wool; they are ſmall, ugly, ill-made, and in general devoured by the *leproſy*, which occaſioned the diſcoverer Bougainville to call it the *Iſle of Lepers*: few women were ſeen, but they were altogether as diſguſting as the men. They go naked, hardly covering their waiſts with a mat." They carry their children on their backs in a kind of ſcarf. They wear ornaments in their noſtrils; and have no beards.—*ib.*

LE ROACH *Iſland*, is near Faulkland's Iſlands; diſcovered in 1657.—*ib.*

LES CAYES, a juriſdiction on the S. ſide of the French part of the iſland of St Domingo, contains 4 pariſhes and yields abundance of ſugar, cotton, and coffee. Its exports from the town Les Cayes from January 1, 1789, to Dec. 31, of the ſame year, were 2,597,666lbs. white ſugar; 24,526,050lbs. brown ſugar; 3,025,604lbs. coffee; 855,447 cotton; 169,

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* *Dr Robertſon.*

305lbs. indigo; and ſmall articles to the value of 8,256 livres. The value of duties paid on the above on exportation 101,528 dollars, 85 cents. The town *Les Cayes* lies between the villages Torbeck and Cavaillon, on the large bay which ſets up to the iſland Avache; from which it is about 3 leagues diſtant, and 5 leagues northerly of Point Abacon. N. lat. 18° 12′, W. long. from Paris 76° 8′.—*ib.*

LESLIE (Charles), was a man ſo eminent for his learning, his talents, and his piety, that a fuller account of him than that which is given in the *Encyclopædia* muſt be acceptable to our Chriſtian readers. He was the ſecond ſon of Dr John Leſlie biſhop of Clogher in Ireland, who was deſcended from an ancient family in the north of Scotland, and being an admirable ſcholar, roſe to the dignity of biſhop of Orkney in his own country, whence he was tranſlated, in 1633, to Raphoe in Ireland, and afterwards, in 1661, to the ſee of Clogher.

Our author was born in Ireland, but in what year we have not learned. A ludicrous ſtory goes indeed of his having been begotten in priſon, and of his father having ſaid that he hoped he would in conſequence become the greateſt ſcourge of the covenanters that Great Britain or Ireland had ever ſeen. This ſtory, with all its circumſtances as told to us, can hardly be true; but we think it could not have been fabricated, had not Charles Leſlie been born within a year of Cromwell's conqueſt of Ireland, when the good biſhop, having ſuſtained a ſiege in his caſtle of Raphoe againſt that arch rebel, was ſome time kept in cloſe confinement.

We are equally ignorant of the ſchool where he was educated as of the year of his birth; but we know that he had his academical education in Trinity College, Dublin, where he took the degree of maſter of arts. In the year 1671, he loſt his father, when he came over to England, and, entering himſelf in the temple, ſtudied law for ſome years, but afterwards relinquiſhed it for the ſtudy of divinity. In 1680, he was admitted into holy orders; and, in 1687, was made chancellor of Connor.

Biographical Dictionary.

About this period he rendered himſelf particularly obnoxious to the Popiſh party in Ireland, by his zealous oppoſition to them, which was thus called forth. Roger Boyle, biſhop of Clogher, dying in 1687, Patrick Tyrrel was made titular Popiſh biſhop, and had the revenues of the ſee aſſigned him by king James. He ſet up a convent of friars in Monaghan: and, fixing his habitation there, held a public viſitation of his clergy with great ſolemnity; when, ſome ſubtle logicians attending him, he was ſo inſolent as to challenge the Proteſtant clergy to a public diſputation. Leſlie undertook the taſk, and performed it to the ſatisfaction of the Proteſtants; though it happened, as it generally does at ſuch conteſts, that both ſides claimed the victory. He afterwards held another public diſputation with two celebrated Popiſh divines, in the church of Tynan, in the dioceſe of Armagh, before a very numerous aſſembly of perſons of both religions; the iſſue of which was, that Mr John Stewart, a Popiſh gentleman, ſolemnly renounced the errors of the church of Rome.

As the Papiſts had got poſſeſſion of an Epiſcopal ſee, they engroſſed other offices too; and a Popiſh high-ſheriff was appointed for the county of Monaghan. This proceeding alarmed the gentlemen in that county; who, depending much on Leſlie's knowledge as a juſtice of peace, repaired to him, then confined, by the gout, to his houſe. He told them, that it would be as illegal in them to permit the ſheriff to act as it would be in him to attempt it. But they inſiſting that he ſhould appear himſelf on the bench at the next quarter-ſeſſions, and all promiſing to ſtand by him, he was carried thither with much difficulty and in great pain. When the ſheriff appeared, and was taking his place, he was aſked whether he was legally qualified; to which he anſwered pertly, "That he was of the king's own religion, and it was his majeſty's will that he ſhould be ſheriff." Leſlie replied, "That they were not inquiring into his majeſty's religion, but whether he (the pretended ſheriff) had qualified himſelf according to law, for acting as a proper officer; that the law was the king's will, and nothing elſe to be deemed ſuch; that his ſubjects had no other way of knowing his will, but as it is revealed to them in his laws: and it muſt always be thought to continue ſo, till the contrary is notified to them in the ſame authentic manner." Upon this, the bench unanimouſly agreed to commit the pretended ſheriff, for his intruſion and arrogant contempt of the court. Leſlie alſo committed ſome officers of that tumultuous army which the Lord Tyrconnel raiſed for robbing the country.

In this ſpirited conduct Leſlie acted like a ſound divine and an upright magiſtrate; but though he thought himſelf authoriſed to reſiſt the illegal mandates of his ſovereign, like many other great and good men, he diſtinguiſhed between active and paſſive obedience, and felt not himſelf at liberty to transfer his allegiance from that ſovereign to another. Refuſing therefore to take the oaths to king William and queen Mary, he was deprived of all his preferments; and in 1689 he removed with his family to England, where he publiſhed the following works, beſides thoſe already noticed in the *Encyclopædia*: 1. Anſwer to Archbiſhop King's State of the Proteſtants in Ireland. 2. Caſſandra, concerning the new Aſſociations, &c. 1703, 4to. 3. Rehearſals; at firſt a weekly paper, publiſhed afterwards twice a-week in a half-ſheet, by way of dialogue on the affairs of the times; begun in 1704, and continued for ſix or ſeven years. 4. The Wolf ſtripped of his Shepherd's Clothing, in Anſwer to Moderation a Virtue, 1704, 4to. The pamphlet it anſwers was written by James Owen. 5. The Biſhop of Sarum's [Burnet's] proper Defence, from a Speech ſaid to be ſpoken by him againſt occaſional conformity, 1704, 4to. 6. The new Aſſociation of thoſe called Moderate Churchmen, &c. occaſioned by a pamphlet, intitled, the Danger of Prieſtcraft, 1705, 4to. 7. The new Aſſociation, part 2d, 1705, 4to. 8. The Principles of Diſſenters concerning Toleration and occaſional Conformity, 1705, 4to. 9. A Warning for the Church of England, 1706, 4to. Some have doubted whether theſe two pieces were his. 10. The good old Cauſe, or Lying in Truth; being the ſecond Defence of the Biſhop of Sarum from a ſecond Speech, &c. 1710. For this a warrant was iſſued out againſt Leſlie. 11. A Letter to the Biſhop of Sarum, in Anſwer to his Sermon after the Queen's Death, in Defence of the Revolution, 1715. 12. Salt for the Leech. 13. The Anatomy of a Jacobite. 14. Gallienus redivivus. 15. Delenda Carthago. 16. A Letter to Mr William Molyneux, on his Caſe of Ireland's being bound by the Engliſh Acts of Parliament. 17. A Letter to Julian Johnſon. 18.

Several Tracts againſt Dr Higden and Mr Hoadly. 19. A Diſcourſe, ſhewing who they are that are now qualified to adminiſter Baptiſm. 20. The Hiſtory of Sin and Hereſy, &c. 1698, 8vo. 21. The Truth of Chriſtianity demonſtrated, in a Dialogue between a Chriſtian and a Deiſt, 1711, 8vo.—Againſt the Papiſts: 22. Of private Judgment and Authority in Matters of Faith. 23. The Caſe ſtated between the Church of Rome and the Church of England, &c. 1713. 24. The true notion of the Catholic Church, in Anſwer to the Biſhop of Meaux's Letter to Mr Nelſon, &c.

Beſides theſe, he publiſhed the four following tracts: 25. A Sermon preached in Cheſter, againſt Marriages in different Communions, 1702, 8vo. This ſermon occaſioned Mr Dodwell's diſcourſe upon the ſame ſubject. 26. A Diſſertation concerning the Uſe and Authority of Eccleſiaſtical Hiſtory. 27. The Caſe of the Regal and the Pontificate. 28. A Supplement, in Anſwer to a Book, intitled, The regal Supremacy in Eccleſiaſtical Affairs aſſerted, &c. Theſe two laſt pieces were occaſioned by the diſpute about the rights of convocation, between Wake, &c. on one ſide, and Atterbury and his friends, among whom was Leſlie, on the other.

It is ſaid by the authors of the Biographical Dictionary, that, in conſequence of a publication of his, intitled, "The hereditary right of the crown of England aſſerted," he was under the neceſſity of leaving the kingdom; and that he repaired to the Pretender at *Bar le duc*, where he was allowed to officiate, in a private chapel, after the rites of the church of England; and where he endeavoured, though in vain, to convert the Pretender to the Proteſtant religion.

That he repaired to *Bar le duc*, and endeavoured to convert to the church of England him whom he conſidered as the rightful ſovereign of England, is indeed true; but we have reaſon to believe that this was not in conſequence of his being obliged to leave the kingdom. There is, in the firſt place, ſome grounds to believe, that "The hereditary right of the crown of England aſſerted" was not written by him; and there is ſtill in exiſtence undoubted evidence, that, in conſequence of his great fame as a polemic, he was ſent to *Bar le duc* for the expreſs purpoſe of endeavouring to convert the ſon of James II. by ſome gentlemen of fortune in England, who wiſhed to ſee that prince on the throne of his anceſtors. The writer of this article had the honour, 16 or 17 years ago, to be known to the granddaughter of one of thoſe gentlemen—a lady of the ſtricteſt veracity; and from her he received many anecdotes of Leſlie and his aſſociates, which, as he did not then foreſee that he ſhould have the preſent occaſion for them, he has ſuffered to ſlip from his memory. That lady is ſtill alive, and we have reaſon to believe is in poſſeſſion of many letters by Leſlie, written in confidence to her grandfather, both from *Bar le duc* and from St Germains; and by the account which ſhe gave of theſe letters, Leſlie appears to have conſidered his prince as a weak and incorrigible bigot, though, in every thing but religion, an amiable and accompliſhed man. This may have been his genuine character; for we all know that it was the character of his father; but it is not of him that we are writing.

Mr Leſlie having remained abroad from the year 1709 till 1721, returned that year to England, reſolving, whatever the conſequences might be, to die in his own country. Some of his friends acquainting lord Sunderland with his purpoſes, implored his protection for the good old man, which his lordſhip readily and generouſly promiſed. Mr Leſlie had no ſooner arrived in London, than a member of the houſe of commons officiouſly waited on lord Sunderland with the news, but met with ſuch a reception from his lordſhip as the malice of his errand deſerved. Our author then went over to Ireland, where he died April 13, 1722, at his own houſe at Glaſlough in the county of Monaghan.

His character may be ſummed up in a few words. Conſummate learning, attended by the loweſt humility, the ſtricteſt piety without the leaſt tincture of moroſeneſs, a converſation to the laſt degree lively and ſpirited, yet to the laſt degree innocent, made him the delight of mankind, and leaves what Dr Hickes ſays of him unqueſtionable, that he made more converts to a ſound faith and holy life than any other man of our times.

A charge, however, has been lately brought againſt him of ſuch a nature, as, if well founded, muſt detract not only from his literary fame, but alſo from his integrity. "The ſhort and eaſy Method with the Deiſts" is unqueſtionably his moſt valuable, and apparently his moſt original work; yet this tract is publiſhed in French among the works of the Abbé St Real, who died in 1692; and therefore it has been ſaid, that unleſs it was publiſhed in Engliſh prior to that period, Charles Leſlie muſt be conſidered as a ſhameleſs plagiary.

The Engliſh work was certainly not publiſhed prior to the death of Abbé St Real; for the firſt edition bears date July 17th 1697; and yet many reaſons conſpire to convince us, that our countryman was no plagiary. There is indeed a ſtriking ſimilarity between the Engliſh and the French works; but this is no complete proof that the one was copied from the other. The article Philology in the *Encyclopædia*, of which Dr Doig is the author, was publiſhed the very ſame week with Dr Vincent's diſſertation on the Greek verb. It was therefore impoſſible that either of theſe learned men, who were till then ſtrangers to each other's names, could have ſtolen aught from the other; and yet Dr Vincent's derivation of the Greek verb bears as ſtriking a reſemblance to Dr Doig's as the Abbé St Real's work does to Charles Leſlie's. In the article Miracle (*Encycl.*), the credibility of the goſpel miracles is eſtabliſhed by an argument, which the author certainly borrowed from no man, and which the late principal Campbell conſidered as original; yet within half a year of the publication of that article, the credibility of the goſpel-miracles was treated in the very ſame manner by F. Sayers, M. D. though there is in his diſſertation complete internal evidence that he had not ſeen the article in the *Encyclopædia*. Not many months ago, the author of this ſketch reviewed, in one of the journals, the work of a friend, which was at the ſame time reviewed in another journal, that at this moment he has never ſeen. Yet he has been told by a friend, who is much verſant in that kind of reading, and knows nothing of his concern with either review, that the book in queſtion muſt, in both journals, have been reviewed by the ſame hand; becauſe in both the ſame character is given of it in almoſt the very ſame words!

After theſe inſtances of apparent plagiariſm, which we know to be *only* apparent, has any man a right to ſay that Charles Leſlie and the Abbé St Real might

Leſlie.

not have treated their ſubject in the way that they have done, without either borrowing from the other? The coincidence of arrangement and reaſoning in the two works is indeed very ſurpriſing; but it is by no means ſo ſurpriſing as the coincidence of etymological deductions which appears in the works of the Doctors Doig and Vincent. The divines reaſon from the acknowledged laws of human thought; the reaſonings of the grammarians, with all due deference to their ſuperior learning, we cannot help conſidering as ſometimes fanciful.

But this is not all that we have to urge on the ſubject. If there be plagiariſm in the caſe, and the identity of titles looks very like it, it is infinitely more probable that the editor of St Real's works ſtole from Leſlie, than that Leſlie ſtole from St Real, unleſs it can be proved that the works of the Abbé, and this work in particular, were publiſhed before the year 1697. At that period, the Engliſh language was very little read or underſtood on the continent; whilſt in Britain the French language was, by *ſcholars*, as generally underſtood as at preſent. Hence it is, that ſo many Frenchmen, and indeed foreigners of different nations, thought themſelves ſafe in pilfering ſcience from the Britiſh philoſophers*; whilſt there is not, that we know, one well authenticated inſtance of a Britiſh philoſopher appropriating to himſelf the diſcoveries of a foreigner. If, then, ſuch men as Leibnitz, John Bernoulli, and Des Cartes, truſting to the improbability of detection, condeſcended to pilfer the diſcoveries of Hooke, Newton, and Harriot, is it improbable that the editor of the works of St Real would claim to his friend a celebrated tract, of which he knew the real author to be obnoxious to the government of his own country, and therefore not likely to have powerful friends to maintain his right?

* See *Quantity* (Encycl.), *Aſtronomy*, *Dynamics*, *Impulſion*, and *Harriot*, in this Suppl.

But farther, Burnet, biſhop of Sarum, was an excellent ſcholar, and well read, as every one knows, in the works of foreign divines. Is it conceivable, that this prelate, when ſmarting under the laſh of Leſlie, would have let ſlip ſo good an opportunity of covering with diſgrace his moſt formidable antagoniſt, had he known that antagoniſt to be guilty of plagiariſm from the writings of the Abbé St Real? Let it be granted, however, that Burnet was a ſtranger to theſe writings and to this plagiariſm; it can hardly be ſuppoſed that *Le Clarc* was a ſtranger to them likewiſe. Yet this author, when, for reaſons beſt known to himſelf, he choſe (1706) to depreciate the argument of *the ſhort method*, and to traduce its author as ignorant of ancient hiſtory, and as having brought forward his four marks for no other purpoſe than to put the deceitful traditions of Popery on the ſame footing with the moſt authentic doctrines of the goſpel, does not ſo much as inſinuate that he borrowed theſe marks from a Popiſh abbé, though ſuch a charge, could he have eſtabliſhed it, would have ſerved his purpoſe more than all his rude railings and invective. But there was no room for ſuch a charge. In the ſecond volume of the works of St Real, publiſhed in 1757, there is indeed a tract entitled *Methode Courte et Aiſée pour combaitre les Deiſtes*; and there can be little doubt but that the publiſher wiſhed it to be conſidered as the work of his countryman. Unfortunately, however, for his deſign, a catalogue of the Abbé's works is given in the firſt volume; and in that catalogue the *Methode Courte et Aiſée* is not mentioned.

Lever, || Lewiſtown.

We have dwelt thus long on *The Short and Eaſy Method with the Deiſts*, becauſe it is one of the ableſt works that ever was written in proof of the Divine origin of the Jewiſh and Chriſtian Scriptures; a work of which the merit is acknowledged by Lord Bolingbroke, and which, as has been obſerved elſewhere (ſee Theology, n° 16. *Encycl.*) Dr Conyers Middleton confeſſes to be unanſwerable. If by men of ſcience we be thought to have ſpent our time well in vindicating the rights of our illuſtrious philoſophers Hooke and Newton, to diſcoveries which have been unjuſtly claimed by the philoſophers of Germany and France; we will not ſurely by the friends of Chriſtianity be thought to have employed our time ill in vindicating Leſlie's claim to this deciſive argument in ſupport of our holy religion.

LEVER, the firſt of the mechanical powers, for the properties of which ſee Mechanics; and for a demonſtration of its fundamental property, ſee Steel yard, both in the *Encyclopædia*.

LEWISBURG, a county in Orangeburgh diſtrict, S. Carolina.—*Morſe*.

Lewisburg, a poſt-town of N. Carolina, and capital of Franklin county. It is ſituated on Tar river, and contains between 20 and 30 houſes, a court-houſe and gaol. It is 30 miles N. of Raleigh, 25 ſouth of Warrenton, 56 from Tarborough, and 411 from Philadelphia.—*ib.*

Lewisburg, a poſt-town, and the chief town of Greenbriar county, Virginia; ſituated on the N. ſide of Greenbriar river, contains about 60 houſes, a court-houſe and gaol. It is 250 miles W. by N. of Richmond, and 486 W. by S. of Philadelphia. N. lat. 38° 8′.—*ib.*

Lewisburg, or *Tarſtown*, a town of Northumberland county, Pennſylvania; ſituated on the weſt ſide of the Suſquehannah, 7 miles above Northumberland. It contains about 60 houſes, and is well ſituated for carrying on a briſk trade with the N. W. part of the State. It is 30 miles E. by N. of Aaronſburg.—*ib.*

LEWISTOWN, a plantation in Lincoln county, Diſtrict of Maine, ſituated on the eaſt ſide of Androſcoggin river, and bounded S. W. by Bowdoin. Lewiſtown and Gore contain 532 inhabitants. It is 36 miles N. E. of Portland.—*ib.*

Lewistown, or *Lewes*, a town in Suſſex county, Delaware, is pleaſantly ſituated on Lewes creek, 3 miles above its mouth in Delaware Bay, and as far W. by N. of the light-houſe on Cape Henlopen. It contains a Preſbyterian and Methodiſt church, and about 150 houſes, built chiefly on a ſtreet which is more than 3 miles in length, and extending along a creek, which ſeparates the town from the pitch of the cape. The ſituation is high, and commands a full proſpect of the light-houſe, and the ſea. The court-houſe and the gaol are commodious buildings, and give an air of importance to the town. The ſituation of this place muſt at ſome future time render it of conſiderable importance. Placed at the entrance of a bay, which is crowded with veſſels from all parts of the world, and which is frequently cloſed with ice a part of the winter ſeaſon, neceſſity ſeems to require, and nature ſeems to ſuggeſt, the forming this port into a harbour for ſhipping. The deficiency of water in the creek, may be cheaply and eaſily ſupplied by a ſmall canal ſo as to afford a paſſage for the waters of Rehoboth into Lewes creek, which would enſure an adequate ſupply. The circumjacent country is beautifully diverſified with hills, woods, ſtreams, and lakes, forming an agreeable contraſt to the naked ſandy beach, which terminates in the cape; but it is greatly infeſted with muſketoes and ſand-flies. It carries on a ſmall trade with Philadelphia in the productions of the country. A manufacture of marine and glauber ſalts, and magneſia, has been lately eſtabliſhed here, which is managed by a gentleman ſkilled in the practical knowledge of chemiſtry. It is 115 miles ſouth of Philadelphia. N. lat. 38° 6′, W. long. 75° 18′.—*ib.*

Lewistown, the chief town of Mifflin county, Pennſylvania, ſituated on the northern ſide of Juniatta river, on the W. ſide, and at the mouth of Ciſhicoquilis creek; a ſhort way weſt of the Long Narrows in Juniatta river, and about 23 miles north-eaſterly of Huntingdon. It is regularly laid out, and contains about 120 dwelling-houſes, a court-houſe and gaol. It was incorporated in 1795, and is governed by two burgeſſes, one high conſtable, a town-clerk, and two aſſiſtants. It is 150 miles W. N. W. of Philadelphia. N. lat. 40° 33′, W. long. 77° 23′.—*ib.*

LEWUNAKHANNEK, a town on the Ohio, where Chriſtian Indians ſettled under the care of the Moravian miſſionaries.—*ib.*

LEXAWACSEIN, a ſmall river of Pennſylvania, which riſes by ſeveral branches in Northampton county, Pennſylvania, on the eaſt ſide of Mount Ararat; theſe unite about 10 miles from its mouth in Delaware river. Its courſe is S. E. and eaſt. It joins the Delaware about 174 miles above Philadelphia.—*ib.*

LEXINGTON, a poſt-town of Virginia, and capital of Rockbridge county. It is ſituated on the poſt-road from Philadelphia to Kentucky, by way of the wilderneſs, and about a mile ſouth of the north branch of James's river. It contains a court-houſe, gaol, and about 100 houſes. The ſituation of the town is healthy and agreeable, and the country round highly cultivated. It is 159 miles W. by N. of Richmond, 398 from Philadelphia, and 465 from Danville in Kentucky.—*ib.*

Lexington, a poſt-town of Kentucky, and formerly the metropolis of that State. It is ſituated on a rich extenſive plain, in Fayette county, on the north ſide of Town Fork, a ſmall ſtream which falls into the ſouth branch of Elkhorn river. It is built on a regular plan, and contains about 250 houſes, 3 places of public worſhip, a court-houſe and gaol. It contains 2 printing-offices, which publiſh two weekly gazettes; has ſeveral ſtores of goods well aſſorted, and is a flouriſhing, agreeable place. It is ſituated in the midſt of a fine tract of country, on the head waters of Elkhorn river, 24 miles eaſt of Frankfort, and 774 S. W. by W. of Philadelphia. Its inhabitants are ſuppoſed to amount now (1796) to 2,000; among whom are a number of very genteel families, affording very agreeable ſociety. N. lat. 38° 6′, W. long. 85° 8′. Near this town are found curious ſepulchres full of human ſkeletons. It has been aſſerted that a man in or near the town, having dug 5 or 6 feet below the ſurface of the ground, came to a large flat ſtone, under which was a well of common depth, regularly and artificially ſtoned. In the vicinity of Lexington are found the remains of two ancient fortifications, furniſhed with ditches and baſtions, overgrown with large trees.—*ib.*

Lexington, a county in Orangeburgh diſtrict, S. Carolina.—*ib.*

Lexington, formerly called the *Great Falls*, a ſmall town of Georgia, ſituated on the ſouth ſide of Ogeechee river, on a beautiful eminence which overlooks the falls of the river. It is 2 miles from Georgetown, and 30 from Greenſborough.—*ib.*

Lexington, a town in Middleſex county, Maſſachuſetts, 10 miles N. W. of Boſton, having a neat Congregational church, and a number of compact houſes. It has been rendered famous by the battle fought in it, April 19, 1775, which may be conſidered as the commencement of the American revolution. This townſhip contains 941 inhabitants, and was incorporated in 1712.—*ib.*

LEYDEN, a townſhip in Hampſhire county, Maſſachuſetts, between Colerain and Bernardſton, 29 miles from Northampton, the ſhire town, and 117 N. W. of Boſton. It was incorporated in 1784, and contains 989 inhabitants.—*ib.*

LEZARS, an Indian nation, who inhabit between the mouth of the Ohio and Wabaſh rivers. They can furniſh 300 warriors.—*ib.*

LIBERTY, a poſt-town of Virginia, 15 miles from New-London, 35 from Fincaſtle, 40 from Franklin court-houſe, and 65 from Martinſburg.—*ib.*

Liberty-Town, a village of Maryland, ſituated in Frederick county, 10 miles north-eaſt of Frederickſtown, and about 44 N. N. W. of the Federal City. Copper mines have been found near this town, and have been worked; but to no great extent as yet.—*ib.*

LICENSER of Books (ſee Liberty *of the Preſs*, *Encycl.*), has been an officer in almoſt every civilized nation, till the end of the laſt century that the office was aboliſhed in Great Britain. Profeſſor Beckmann, with his uſual induſtry,* has proved that ſuch an office was eſtabliſhed not only in the Roman Empire, but even in the republic, and in the free ſtates of ancient Greece. At Athens, the works of Protagoras were prohibited; and all the copies of them which could be collected were burnt by the public crier. At Rome, the writings of Numa, which had been found in his grave, were, by order of the ſenate, condemned to the fire, becauſe they were contrary to the religion which he had introduced. As the populace at Rome were, in times of public calamity, more addicted to ſuperſtition than ſeemed proper to the government, an order was iſſued, that all ſuperſtitious and aſtrological books ſhould be delivered into the hands of the prætor. This order was often repeated; and the emperor Auguſtus cauſed more than twenty thouſand of theſe books to be burnt at one time. Under the ſame emperor the ſatirical works of Labienus were condemned to the fire, which was the firſt inſtance of this nature; and it is related as ſomething ſingular, that, a few years after, the writings of the perſon who had been the cauſe of the order for that purpoſe ſhared the like fate, and were alſo publicly burnt. When Cremutius Cordus, in his hiſtory, called C. Caſſius the laſt of the Romans, the ſenate, in order to flatter Tiberius, cauſed the book to be

* *Hiſtory of Inventions*, vol. 3.

burnt; but a number of copies were ſaved by being concealed. Antiochus Epiphanes cauſed the books of the Jews to be burnt; and in the firſt centuries of our æra the books of the Chriſtians were treated with equal ſeverity, of which Arnobius bitterly complains. We are told by Euſebius, that Diocleſian cauſed the ſacred Scriptures to be burnt. After the ſpreading of the Chriſtian religion the clergy exerciſed, againſt books that were either unfavourable or diſagreeable to them, the ſame ſeverity which they had cenſured in the heathens as fooliſh and prejudicial to their own cauſe.

Soon after the invention of printing, laws began to be made for ſubjecting books to examination; a regulation propoſed even by Plato; and which has been wiſhed for by many ſince. Our author gives a great deal of curious information on this important ſubject, which our limits do not permit us to repeat; but it is apparent from his work, that the liberty of the preſs is but a modern privilege; and it has not been enjoyed completely in any country but in Britain and America.

LICHEN (ſee *Encycl.*), is a genus of plants, of which the moſt valuable ſpecies ſeems to be the LICHEN ROCELLA, or *Argol*. As that ſpecies has not been noticed in the article referred to, the following account of it from Profeſſor Beckmann will be acceptable to many of our readers:

It is found in abundance in ſome of the iſlands near the African coaſt, particularly in the Canaries, and in ſeveral of the iſlands in the Archipelago. It grows upright, partly in ſingle, partly in double ſtems, which are about two inches in height. When it is old, theſe ſtems are crowned with a button ſometimes round, and ſometimes of a flat form, which Tournefort, very properly, compares to the excreſcences on the arms of the ſepia. Its colour is ſometimes a light, and ſometimes a dark grey. Of this moſs, with lime, urine, and alkaline ſalts, is formed a dark red paſte, which in commerce has the ſame name, and which is much uſed in dyeing. That well known ſubſtance called lacmus is alſo made of it.

Theophraſtus, Dioſcorides, and their tranſcriber Pliny, give the name of *Phycos thalaſſion*, or *pontion*, to this plant, which, notwithſtanding its name, is not a ſea weed but a moſs; as it grew on the rocks of different Iſlands, and particularly on thoſe of Crete or Candia. It had, in their time, been long uſed for dyeing wool, and the colour it gave when freſh was ſo beautiful, that it excelled the ancient purple, which was not red, as many ſuppoſe, but violet. Pliny tells us, that with this moſs dyers gave the ground or firſt tint to thoſe cloths which they intended to dye with the coſtly purple. When it was firſt employed as a dye by the moderns, is not ſo certain, though the Profeſſor has proved, we think completely, that it muſt have been at leaſt as early as the beginning of the 14th century.

"Among the oldeſt and principal Florentine families (ſays he), is that known under the name of the Oricellarii or Rucellarii, Ruſcellai or Rucellai, ſeveral of whom have diſtinguiſhed themſelves as ſtateſmen and men of letters. This family are deſcended from a German nobleman, named Ferro or Frederigo, who lived in the beginning of the twelfth century. One of his deſcendants, in the year 1300, carried on a great trade in the Levant, by which he acquired conſiderable riches, and returning at length to Florence, with his fortune, firſt made known in Europe the art of dyeing with argol. It is ſaid, that a little before his return from the Levant, happening to make water on a rock covered with this moſs, he obſerved, that the plant, which was there called *reſpio*, or *reſpo*, and in Spain *orciglia*, acquired by the urine a purple, or, as others ſay, a red colour. He therefore tried ſeveral experiments; and when he had brought to perfection the art of dyeing wool with this plant, he made it known at Florence, where he alone practiſed it for a conſiderable time, to the great benefit of the ſtate. From this uſeful invention, the family received the name of Oricellarii, from which, at laſt, was formed Rucellai." The Profeſſor, however, does not believe that this Florentine diſcovered the dye by means of the above mentioned accident, but that he learned the art in the Levant, and on his return taught it to his countrymen.

"Our dyers do not purchaſe raw argol, but a paſte made of it, which the French call *orſeille en pâte*. The preparation of it was for a long time kept a ſecret by the Florentines. The perſon who, as far as I know, made it firſt known was Roſetti; who, as he himſelf tells us, carried on the trade of dyer at Florence. Some information was afterwards publiſhed concerning it by Imperati * and Micheli the botaniſt.† In later times this art has been much practiſed in France, England, and Holland. Many druggiſts, inſtead of keeping this paſte in a moiſt ſtate with urine, as they ought, ſuffer it to dry, in order to ſave a little dirty work. It then has the appearance of a dark violet-coloured earth, with here and there ſome white ſpots in it.

"The Dutch (continues our author), who have found out better methods than other nations of manufacturing many commodities, ſo as to render them cheaper, and thereby to hurt the trade of their neighbours, are the inventors alſo of lacmus, a preparation of argol, called *orſeille en pierre*, which has greatly leſſened the uſe of that *en pâte*, as it is more eaſily tranſported and preſerved, and fitter for uſe; and as it is beſides, if not cheaper, at leaſt not dearer. This art conſiſts, undoubtedly, in mixing with that commodity ſome leſs valuable ſubſtance, which either improves or does not much impair its quality, and which, at the ſame time, increaſes its weight (A). Thus do they pound cinnabar and ſmalt finer than other nations, and yet ſell both theſe articles cheaper. Thus do they ſift cochineal, and ſell it cheaper than what is unſifted.

"It was for a long time believed, that the Dutch prepared their lacmus from thoſe linen rags which in the ſouth of France are dipped in the juice of the *croton tinctorium*; but at preſent, it is almoſt certainly known, that *orſeille en pâte* is the principal ingredient in *orſeille en pierre* that is in lacmus; and for this curious information we are indebted to Ferber. But whence ariſes the ſmell of the lacmus, which appears ſo like that of the

* Lib. xxvii. c. 9.

† *Nova Plantarum genera Florenciæ*, 1729.

(A) As dry lacmus is much cheaper than moiſt, it may be readily ſuppoſed that it is adulterated with ſand and other ſubſtances. *Valentini Hiſtoria ſimplicium.* Francf. ad Moen. 1716. fol. p. 152.

the Florentine iris?" Some of the latter may, perhaps, be mixed with it; for our author thinks, that he has obſerved in it ſmall indiſſoluble particles, which may have been bits of the roots. The addition of this ſubſtance can be of no uſe to improve the dye; but it may increaſe the weight, and give the lack more body; and perhaps it may be employed to render imperceptible ſome unpleaſant ſmell, for which purpoſe the roots of that plant are uſed on many other occaſions.

LICHTENAU, a Moravian ſettlement on the eaſt ſide of Muſkingum river, 3 miles below Goſchachguenk; but as the warriors paſſed conſtantly through this place, it was forſaken, and they removed to Salem, 5 miles below Gnadenhuetten.—*Morse.*

LICK, a name by which ſalt ſprings are called in the weſtern parts of the United States.—*ib.*

LICKING, a navigable river of Kentucky, which riſes on the weſtern confines of Virginia; interlocks with the head waters of Kentucky river; runs in a N. W. direction, upwards of 180 miles, and by a mouth 150 yards wide flows through the ſouth bank of Ohio river, oppoſite fort Waſhington. Upon this river are iron-works, and numerous ſalt ſprings. Its principal branch is navigable nearly 70 miles. From Limeſtone to this river, the country is very rich, and covered with cane, rye-graſs, and natural clover.—*ib.*

LIGHT, it has been obſerved in the article CHEMISTRY, n° 319. (*Suppl.*), conſiſts of rays differently flexible. This was eſtabliſhed by ſome well deviſed experiments made by Henry Brougham, Eſq; of which it may be proper to give an account here.

In the firſt experiment, he darkened his chamber in the uſual way, and let a beam of the ſun's light into it through the hole of a metal plate fixed in the ſhutter of the window, $\frac{1}{30}$th of an inch in diameter. At the hole within the room he placed a priſm of glaſs, of which the refracting angle was 45 degrees, and which was everywhere covered with black paper, except a ſmall part on each ſide; and through this part the light was refracted ſo as to form a diſtinct ſpectrum on a chart at ſix feet diſtance from the window. In the rays, at two feet from the priſm, he placed a black unpoliſhed pin, of which the diameter was $\frac{1}{10}$th of an inch, parallel to the chart, and in a vertical poſition. The ſhadow of the pin was found in the ſpectrum; and this ſhadow had a conſiderable penumbra, which was broadeſt and moſt diſtinct in the violet part, narroweſt and moſt confuſed in the red, and of an intermediate thickneſs and diſtinctneſs in the intermediate colours. The penumbra was bounded by curvilinear ſides, convex towards the axis to which they approached as to an aſymptote, ſo as to be neareſt to it in the place of the leaſt refrangible rays. By moving the priſm on its axis, and cauſing the colours to aſcend and deſcend on any bodies that were uſed inſtead of the pin, the red, wherever they fell, made the leaſt, and the violet the greateſt, ſhadow.

In the next experiment, a ſcreen was ſubſtituted in the place of the pin; and this ſcreen had a large hole, on which was a braſs plate pierced with a ſmall hole $\frac{1}{42}$d of an inch in diameter. While an aſſiſtant moved the priſm ſlowly on its axis, the author obſerved the round image made by the different rays paſſing through the hole to the chart; that made by the red was greateſt, that of the violet leaſt, and that of each intermediate ray was of an intermediate ſize. When the ſharp blade of a knife was held at the back of the hole, "ſo as to produce the fringes mentioned by Grimaldo and Newton, theſe fringes in the red were broadeſt and moſt moved inwards to the ſhadow, and moſt dilated when the knife was moved over the hole; and the hole itſelf on the chart was more dilated during the motion when illuminated by the red than when illuminated by any other of the rays, and leaſt of all when illuminated by the violet."

From theſe two experiments, the author infers "that the rays of the ſun's light differ in degree of flexibility, and that thoſe which are leaſt *refrangible* are *moſt inflexible.*" From other experiments, he concludes, that the *moſt inflexible* rays are alſo *moſt deflexible.* In the ſequel of his paper, he aſcertains the proportion which the angle of *inflection* bears to that of *deflection* at equal incidences, and the proportion which the different *flexibilities* of the different rays bear to one another. We ſhall give an account of ſome other experiments made by him, and of the inferences drawn from them, under the word REFLEXITY, to which a reference has already been made.

LIGONIER, *Fort*, lies on the road from Philadelphia to Pittſburg; 266 miles from the former and 54 from the latter, and 9 miles from the E. ſide of Laurel Hill.—*Morse.*

LIGUANEA, mountains in the iſland of Jamaica. At the foot of theſe in St Andrew's pariſh, about 6 miles from Kingſton, is the moſt magnificent botanical garden in the world. It was eſtabliſhed in 1773, under the ſanction of the aſſembly. The fortune of war having thrown into Lord Rodney's hands many rare plants, he preſented to his favoured iſland plants of the genuine cinnamon, the mango, bread-fruit, and other oriental productions; which are now become common in the iſland.—*ib.*

LILLIE, a citadel at Cape Ann, in the townſhip of Glouceſter, Maſſachuſetts.—*ib.*

LIMA, the middle diviſion of Peru, in S. America. It has Quito on the north, the mountains called the Andes on the eaſt, the audience of Los Charcos on the ſouth, and the Pacific ocean on the weſt. There are many wild beaſts in the audience.—*ib.*

LIMA, the capital of Peru, in S. America, is alſo called Los Reyes, or the City of Kings, and is the emporium of this part of the world. It was founded by Don Franciſco Pizarro on the 18th of January, 1535; is ſituated in a large, ſpacious, and fertile plain, called the valley of Rimac, on the ſouth ſide of the river Rimac, which runs weſtward. The name of Lima being only a corrupt pronunciation of the Indian word, which is derived from an idol to which the Indians and their Yncas uſed to ſacrifice. This idol being ſuppoſed to return anſwers to the prayers offered to it, they called it, by way of diſtinction, Rimac, i. e. the ſpeaker.

It is ſo well watered by the river Rimac, that the inhabitants command a ſtream, each for his own uſe. The N. ſide of the town runs nearly cloſe to the river for the length of about 10 furlongs. At about $\frac{1}{3}$ of this ſpace, from the weſtern extent, an elegant ſtone bridge of 4 or 5 arches is built acroſs the river leading ſouth, about 200 yards to the great ſquare, of which the ſide is about 140 yards. The ſtreet continues ſouth from the bridge, for near a mile, having parallel ſtreets, 8 to the weſt, and 6 to the eaſt, beſides other ſtreets which run obliquely ſouth-eaſtward. The 15 ſtreets, running north and ſouth, are croſſed by 8 others running eaſt and weſt, beſides ſeveral to the ſouthward, not parallel to the former, and others in the eaſtern parts, which have different directions. The figure of the town is nearly quadrilateral. A diagonal line running eaſt and weſt, would be 18 furlongs in length; and the ſouthern perpendicular, about 7 furlongs, and the northern about 4 furlongs; ſo that the city ſtands on a ſpace of ground nearly equal to a mile and a quarter ſquare. The northern ſide for about three quarters of a mile next the river, is fortified moſtly by redans; the reſt of the circuit is incloſed with 34 hollow baſtions and their intermediate curtains. The whole is faced with a brick wall, and ſurrounded with a ditch, but has no covered way, glacis, nor outworks. Eight gates, beſides that at the bridge, furniſh a communication with the adjacent country. The city ſtands about 6 miles from Callao, which is the ſea-port to Lima, and 180 north-weſt of Guamanga. The white people in Lima are eſtimated at about 15,000, and the whole number of inhabitants are about 60,000. One remarkable fact is ſufficient to demonſtrate the wealth of this city. When the viceroy, the Duke de la Palada, made his entry into Lima, in 1682, the inhabitants, to do him honour, cauſed the ſtreets to be paved with ingots of ſilver, amounting to 17 millions ſterling. All travellers ſpeak with amazement of the decorations of the churches with gold, ſilver, and precious ſtones, which load and ornament even the walls. The only thing that could juſtify theſe accounts, is the immenſe riches and extenſive commerce of the inhabitants. The merchants of Lima may be ſaid to deal with all the quarters of the world; and that both on their own account, and as factors for others. Here, all the productions of the ſouthern provinces are conveyed, in order to be exchanged at the harbour of Lima, for ſuch articles as the inhabitants of Peru ſtand in need of. The fleet from Europe and the Eaſt-Indies land at the ſame harbour; and the commodities of Aſia, Europe, and America, are there bartered for each other. But all the wealth of the inhabitants, all the beauty of the ſituation, and the fertility of the climate of Lima, are inſufficient to compenſate for the diſaſter which threatens, and has ſometimes actually befallen them. Earthquakes are very frequent.

Since the year 1582, there have happened about fifteen concuſſions, beſides that on the 28th of October, 1746, at half an hour after 10 at night, five hours and three quarters before the full of the moon; which began with ſuch violence, that in little more than three minutes, the greateſt part, if not all the builings, great and ſmall, in the whole city, were deſtroyed; burying under their ruins thoſe inhabitants who had not made ſufficient haſte into the ſtreets and ſquares, the only probable places of ſafety in thoſe terrible convulſions of nature. At length the dreadful effects of the firſt ſhock ceaſed, but the tranquillity was of ſhort duration; concuſſions returning ſo repeatedly, that the inhabitants, according to the account ſent of it, computed 200 in the firſt 24 hours; and to the 24th of February, the following year, 1747, when the narrative was dated, no leſs than 450 ſhocks were obſerved: ſome of which, if leſs permanent, were equal to the firſt in violence. The fort of Callao, at the very ſame hour, tumbled into ruins. But what it ſuffered from the earthquake in its buildings, was inconſiderable, when compared with the terrible cataſtrophe which followed. For the ſea, as is uſual on ſuch occaſions, receding to a conſiderable diſtance, returned in mountainous waves, foaming with the violence of the agitation, and ſuddenly overwhelmed Callao and the neighbouring country. This was not, however, performed by the firſt ſwelling of the waves: For the ſea retiring further, returned with ſtill greater impetuoſity, the ſtupendous water covering both the walls and other buildings of the place; ſo that whatever had eſcaped the firſt, was now totally overwhelmed by thoſe terrible mountains of waves; and nothing remained, except a piece of the wall of the fort of Santa Cruz, as a memorial of this terrible devaſtation. Here were then 23 ſhips and veſſels, great and ſmall, in the harbour, of which 19 were ſunk, and the other four, among which was a frigate called St Fermin, carried by the force of the waves to a conſiderable diſtance up the country. This terrible inundation extended to other parts of the coaſt, as Cavallos and Guanape; the towns of Chancay, Guaura, and the vallies Della Baranco, Sape, and Pativilca, underwent the ſame fate as the city of Lima. According to an account ſent to Lima after this accident, a volcano in Lucanos burſt forth the ſame night, and ejected ſuch quantities of water, that the whole country was overflown; and in the mountain near Patas, called Converſiones de Caxamarquilla, three other volcanoes burſt, diſcharging frightful torrents of water; and in the ſame manner as that of Carguayraſſo. Lima is the ſee of an archbiſhop, and the ſeat of an univerſity. The inhabitants are very debauched; and the monks and nuns, of whom there are great numbers, are no more chaſte than the reſt of the inhabitants. If any one happens to rival a monk, he is in danger of his life, for they always carry daggers concealed. Lima, according to ſeveral obſervations made for that purpoſe, ſtands in lat. 12° 2′ 31″ S. and its long. is 75° 52′ W. The variation of the needle is 9° 2′ 30″ eaſterly.—*ib.*

LIMBE, a village in the N. W. part of the iſland of St Domingo, 7 leagues weſt by ſouth of Cape Francois.—*ib.*

LIMBERS, in artillery, a ſort of advanced train, joined to the carriage of a cannon on a march. It is compoſed of two ſhafts, wide enough to receive a horſe between them, called the *fillet horſe:* theſe ſhafts are joined by two bars of wood, and a bolt of iron at one end, and mounted on a pair of rather ſmall wheels. Upon the axle-tree riſes a ſtrong iron ſpike, which is put into a hole in the hinder part of the train of the gun-carriage, to draw it by. But when a gun is in action, the limbers are taken off, and run out behind it.

LIMERICK, a townſhip in York county, Maine, ſituated near the confluence of Little Oſſipee river with Saco, and oppoſite Gorham in Cumberland county. It was incorporated in 1787, contains 411 inhabitants and is 114 miles northerly of Boſton.—*Morſe.*

Limerick, a townſhip in Montgomery county, Pennſylvania.—*ib.*

LIMESTONE CREEK, in Tenneſſee, is the north-eaſtern branch of Nolachucky river. It riſes 22 miles ſouth of Long-Iſland in Holſton river.—*ib.*

LIMIT of a Planet, has been ſometimes uſed for its greateſt heliocentric latitude.

Limited Problem, denotes a problem that has but one ſolution, or ſome determinate number of ſolutions: as to deſcribe a circle through three given points that do not lie in a right line, which is limited to one ſolution only; to divide a parallelogram into two equal parts by a line parallel to one ſide, which admits of two ſolutions, according as the line is parallel to the length or breadth of the parallelogram; or to divide a triangle in any ratio by a line parallel to one ſide, which is limited to three ſolutions, as the line may be parallel to any of the three ſides.

LIMONADE, a village on the north ſide of the French part of the iſland of St Domingo, 4 leagues ſouth-weſt of Fort Dauphine, and 7½ meaſuring in a ſtraight line ſouth-eaſt of Cape Francois. N. lat. 19° 37′.—*Morſe*.

LINCOLN, a large maritime county of the Diſtrict of Maine; bounded north by Canada, ſouth by the ocean, eaſt by Hancock county, and weſt by that of Cumberland. Its ſea-coaſt extends from that part of Penobſcot Bay oppoſite to Deer Iſland eaſtward, to Cape Small Point weſtward. It is 200 miles long, and 54 broad, and comprehends 46 towns and plantations; but there are large tracts yet unſettled. The population amounts to 29,962 free perſons. The ſea-coaſt of the counties of Cumberland and Lincoln is 100 miles in extent, meaſured in a ſtraight line, but is ſaid to be above 200 by the courſe of the waters. It abounds with ſafe and commodious harbours; and the whole ſhore is covered by a line of iſlands, among which veſſels may generally anchor in ſafety. There are in theſe counties many large rivers, ſome of them navigable far up the country; and although navigation for large veſſels is interrupted by falls, when far up the rivers, yet above the falls, there is plenty of water for boats, nearly to the ſource of the rivers; and by the lakes and ponds and branches of the rivers, there is a water communication, with few interruptions, from the weſtern to the eaſtern bounds, acroſs the country, above the centre of it. By this route its productions may, at a ſmall expenſe, be tranſported to the different ſea-ports. The ſupreme judicial court held in Lincoln county, has civil and criminal juriſdiction in cauſes ariſing in Hancock and Waſhington counties. Chief towns, Pownalborough, Hallowell and Waldoborough.—*ib.*

Lincoln, a county of Morgan diſtrict, North-Carolina; bounded N. E. by Iredell, N. W. by Burke, weſt by Rutherford, and eaſt by Cabarras. It contains 9,224 inhabitants, of whom 935 are ſlaves. Here are mineral ſprings and mines of iron. A furnace and forge have been erected, which carry on the manufacture of pig, bar iron, &c. Chief town, Lincolntown.—*ib.*

Lincoln, a county of Kentucky, bounded north by Mercer, north-weſt by Waſhington, north eaſt by Maddiſon, and ſouth by Logan. By the cenſus of 1790, it contained 6,548 inhabitants, of whom 1,094 were ſlaves. The road from Danville on Kentucky river paſſes through it ſouth-weſterly, and over Cumberland mountain to Virginia.—*ib.*

Lincoln, a town in Mercer county, Kentucky, ſituated on the eaſt ſide of Dick's river, on the road from Danville to Virginia. It ſtands 12 miles ſouth-eaſt of Danville, and 11 north-weſt of Crab-Orchard.—*ib.*

Lincoln, a townſhip in Grafton county, New-Hampſhire, incorporated in 1764, contains 22 inhabitants.—*ib.*

Lincoln, a townſhip in the north-eaſt part of Addiſon county, Vermont, granted Nov. 7th 1780.—*ib.*

Lincoln, a townſhip in Middleſex county, Maſſachuſetts, incorporated in 1754. It contains 740 inhabitants, and is 16 miles north-weſt of Boſton.—*ib.*

LINCOLNTOWN, a poſt-town of N. Carolina, and capital of Lincoln county. It contains about 20 houſes, a court-houſe, and gaol. It is 46 miles from Morgantown, 159 from Salem, and 718 ſouth by weſt of Philadelphia.—*ib.*

LINDLEY, a village on the weſt ſide of the Canawiſque branch of Tioga river, in New-York, 2 miles north of the Pennſylvania line, 8 S. W. by S. of the Painted Poſt, 64 ſouth-eaſt of Hartford, on the road to Niagara.—*ib.*

LINN, a townſhip in Northampton county, Pennſylvania.—*ib.*

LISBON, a town in New-London county, Connecticut, lately a part of Norwich, about 7 miles northerly of Norwich. It contains 2 pariſhes, each having a Congregational church. It lies on the weſt ſide of Quinebaug river, and eaſt of Franklin.—*ib.*

Lisbon, a village of York county, Pennſylvania, ſituated near the ſouth ſide of Yellow Breeches creek, which falls into the Suſquehannah. It contains about 15 houſes, and lies 18 miles from York.—*ib.*

LITCHFIELD, a townſhip in Lincoln county, Diſtrict of Maine, 45 miles from Hallowell, and 220 N. E. of Boſton.—*ib.*

Litchfield, a townſhip in Hillſborough county, New-Hampſhire, ſituated on the eaſt ſide of Merrimack river, about 54 miles weſterly of Portſmouth. It was ſettled in 1749, and in 1775 it contained 284, and in 1790, 357 inhabitants.—*ib.*

Litchfield, a populous and hilly county of Connecticut; bounded north by the State of Maſſachuſetts, ſouth by New-Haven and Fairfield counties, eaſt by Hartford, and weſt by the State of New-York. It is divided into 20 townſhips, containing 38,755 inhabitants, incluſive of 233 ſlaves. The general face of the country is rough and mountainous. The ſoil is fertile, yielding large crops of wheat and Indian corn, and affording fine paſture. It is ſeparate entirely from maritime commerce, and the inhabitants are almoſt univerſally farmers.—*ib.*

Litchfield, the chief town of the above county, ſituated upon an elevated plain, and much expoſed to the cold winds of winter, but enjoys alſo a large ſhare of the refreſhing breezes of ſummer. It is a handſome ſituation, containing about 60 or 70 dwelling-houſes, a court-houſe and meeting-houſe. It is 32 miles weſt of Hartford, and 42 N. N. W. of New-Haven. N. lat. 41° 46′, W. long. 73° 37′. In the S. W. corner of the townſhip ſtands an high hill called Mount Tom. On ſeveral ſmall ſtreams, ſome of which fall into Great Pond, are 3 iron-works, an oil-mill and a number of ſaw and griſt mills.—*ib.*

Litchfield, a townſhip in Herkemer county, New-York, taken from German Flats, and incorporated in 1796.—*ib.*

LITIZ, or *Leditz*, a village or town in Lancaſter county, Pennſylvania, ſituated in Warwick townſhip, on the ſouth ſide of a ſmall ſtream, which ſends its waters through Coneſtoga creek into the Suſquehannah. It contains about 50 houſes chiefly of ſtone, a ſtone tavern, and an elegant church with a ſteeple and bell. The ſettlement was begun in 1757. It is inhabited by the United Brethren, whoſe mode of life and cuſtoms are ſimilar to thoſe of Bethlehem. There is alſo a good farm and ſeveral mill-works belonging to the place. The number of inhabitants, including thoſe that belong to Litiz congregation, living on their farms in the neighbourhood, amounted, in 1787, to upwards of 300. It is 8 miles north of Lancaſter, and 66 W. by N. of Philadelphia.—*ib.*

LITTLE EGG HARBOUR, a port of entry on the eaſt coaſt of New-Jerſey, comprehending all the ſhores, bays and creeks from Barnegat Inlet to Brigantine Inlet, both incluſive. The town of *Tuckerton* is the port of entry for this diſtrict.—*ib.*

LITTLE ALGONQUINS, Indians who inhabit near the Three Rivers, and can raiſe about 100 warriors.—*ib.*

LITTLEBOROUGH, a plantation in Lincoln county, Diſtrict of Maine, having 263 inhabitants.—*ib.*

LITTLE BRITAIN, a townſhip in Lancaſter county, Pennſylvania. Alſo a townſhip in Cheſter county, in the ſame State.—*ib.*

LITTLE-COMPTON, a townſhip in Newport county, Rhode-Iſland, bounded N. by Tiverton; S. by the Atlantic ocean, where are Seakonnet rocks; W. by the eaſt paſſage into Mount Hope Bay; and E. by the State of Maſſachuſetts. It contains 1542 inhabitants, of whom 23 are ſlaves. It was called *Seconnet* or *Seakonnet* by the Indians, and is ſaid to be the beſt cultivated townſhip in the State, and affords greater quantities of meat, butter, cheeſe, vegetables, &c. than any other town of its ſize. The inhabitants are very induſtrious, and manufacture linen and tow cloth, flannels, &c. of an excellent quality, and in conſiderable quantities for ſale.—*ib.*

LITTLE FORT, in the N. W. Territory, ſtands on the ſouth-weſtern bank of lake Michigan, and on the ſouth ſide of Old Fort river, which runs a N. eaſtern courſe into the lake.—*ib.*

LITTLE HARBOUR. It is near the mouth of Paſcataqua river, about a mile from Portſmouth, in New-Hampſhire. A ſettlement was attempted here in 1623.—*ib.*

LITTLE RIVER, in Georgia, is a beautiful and rapid river, and at its confluence with Savannah river, is about 50 yards wide. On a branch of Little river is the town of Wrightſborough. Alſo a river which ſeparates, in part, N. and S. Carolina.—*ib.*

LITTLE RIVER, a plantation in Lincoln county, Diſtrict of Maine, containing 64 inhabitants.—*ib.*

LITTLE ROCKS, on the N. W. bank of Illinois river, are ſituated 60 miles from the Forks, 270 from the Miſſiſſippi river, and 43 S. W. of Fox river. The S. W. end of theſe rocks lies nearly oppoſite to the mouth of Vermilion river, and the two ſmall ponds where the French and Indians have made good ſalt, lie oppoſite the N. E. end. A coal mine half a mile long extends along the bank of the river above theſe rocks.—*ib.*

LITTLE SODUS, a ſmall harbour of lake Ontario, about 15 miles ſouthward of Oſwego.—*ib.*

LITTLETON, a townſhip in Middleſex county, Maſſachuſetts, 30 miles N. W. of Boſton.—*ib.*

LITTLETON, a townſhip in Grafton county, New-Hampſhire, (a part of Apthorpe) was incorporated in 1784, and contains 96 inhabitants. It lies on Connecticut river, below the 15 mile Falls, and nearly oppoſite Concord in Vermont.—*ib.*

LITTLETON, a townſhip in Caledonia county, Vermont, on the W. ſide of Connecticut river, oppoſite the 15 mile Falls, and contains 63 inhabitants.—*ib.*

LITTLETON, FORT, in Pennſylvania, is 27 miles E. of Bedford, 39 S. W. by W. of Carliſle, and 34 N. by E. of Fort Frederick, in Waſhington county, Maryland.—*ib.*

LIVERMORE, a plantation in Cumberland county, Diſtrict of Maine, ſituated on Androſcoggin river, 19 miles N. W. of Hallowell.—*ib.*

LIVERPOOL, a town on the S. ſide of the Bay of Fundy, in Queen's county, Nova-Scotia, ſettled by New-Englanders. Roſſignol, a conſiderable lake, lies between this town and Annapolis. It is 32 miles north-eaſt of Shelburne, and 58 north-weſt of Halifax. It was formerly called *Port Roſſignole.*—*ib.*

LIVINGSTON, a townſhip in Columbia county, New-York, ſituated on the eaſt bank of Hudſon's river, 4 miles northerly of Palatine town, 11 ſouth of Hudſon, and 9 ſouth-eaſt of Claverack. It contains 4,594 inhabitants; of whom 659 are electors, and 233 ſlaves.—*ib.*

LIVINGSTON'*s Creek*, a conſiderable branch of North-Weſt, an arm of Cape Fear river. This creek heads in vaſt ſwamps in the vicinity of the beautiful lake Waukama.—*ib.*

LOBOS, iſlands on the coaſt of Brazil. The ſouthernmoſt iſland is in ſouth latitude 6° 27′. One of theſe iſlands obtains the name of *Lobos de la mer;* the other, which lies to the north of it, and very like it in ſhape and appearance, is called *Lobos de tierra.*—*ib.*

LOBOS or WOLVES Iſland, in the river of La Plata, on the E. coaſt of South America, is the firſt iſland within that river, a little S. from the N. point of the entrance, called Cape St Mary. Palm Iſland is on the ſhore nearly N. from it, but without the cape and Maldonada Iſland is within it, off the mouth of Maldonada Bay, on the N. ſhore alſo.—*Malham.*

LOBOS or WOLVES Iſland, on the coaſt of Peru, on the W. ſide of South America, and on the S. Pacific Ocean, is a league and a half from the Morro Quemada, or headland of Quemada. It is a ſmall iſland, about three quarters of a league in length, in the direction of N. W. and S. E. and the land is indifferently high. Several flat low rocks lie between this iſland and the main, which ſtretch out towards the headland half over the channel, and leave the paſſage between very narrow and dangerous, though ſome ſhips have paſſed through by miſtake, ſuppoſing it to have been the channel between St Gallan Iſland and the headland of Paraca. But ſuch an error muſt have been occaſioned by great inattention, as they are very readily known and diſtinguiſhed from each other; becauſe this iſland of Lobos is foul and has rocks all round it, and one in particular, which is called the Breaker, ſtands above the water like a ſugar-loaf, but the iſland of St

Gallan is all clean and bold, and has no rocks about it, beſides the advantage of a much broader channel. The appearance of the land on the main alſo differs very much, that of Paraca being of an equal height, but this of Morro Quemada comes down ſloping from the N. ſide, from a vaſt high mountain quite to the ſhore, where ſhips anchor on the ſtarboard ſide of the entrance.

But as ſhips have paſſed through between the iſland of Lobos and the main by miſtake, it is a demonſtration that the meaſure is practicable. It is certain that there is a ſufficient depth of water, but the hazard is that ſhips may touch upon the rocks, becauſe in coming out to the northward there is a ledge of rocks, as has been mentioned already, that reaches almoſt half over towards the main. To the northward of this ledge of rocks there is alſo a ſmooth bank of ſand, which forms as it were a creek between it and the iſland; and the ſea is here ſo ſtill, being kept off by that ſand, that it makes a good road, where a ſhip may anchor in from 7 to 8 fathoms water, and, if occaſion required, might venture to careen in it; but care ſhould be taken to ſound it well before any ſhip ventures into it. From this iſland to the Morro de Vejas, or Old Man's Headland, is only half a league. The lat. of the iſland is about 14° 40′ S.—*ib.*

Lobos Iſland, or *Ilha de* Lobos, otherwiſe called Sea Wolves Iſland, off the port of Guara on the coaſt of Peru, is in lat. about 11° 30′ S. It is but a ſmall iſland, and near to it is a ſhoal, without which it is particularly neceſſary to keep at a good diſtance, as being very dangerous, and having but little depth of water within it. It muſt be brought a-ſtern to anchor in the port of Guara, according to the directions there given.—*ib.*

Lobos Iſlands, diſtinguiſhed by the Spaniards from their ſituation into Lobos de Barlevento and Lobos de Sotovento, or the windward and leeward iſlands of Lobos, are about 7 leagues from each other, and not far from the coaſt of Peru, in lat. 6° 25′ and 6° 45′ S. Theſe alſo are called Sea Wolves or Seals Iſlands. It is ſufficient to point out their ſituation, ſo as to avoid them, according as ſhips are paſſing to the windward or leeward of them. The Lobos de Sotovento, or the Leeward Iſland, to the N. W. from the other, is about 2 leagues in circuit, and is low, but has ſome high rocks about it; from which to Cape Aguja to the northward is about 5 leagues.—*ib.*

Lobos de Payta, or Seals Iſland, to the northward of Cape Anguja, ſo called from Port Pata, which is 11 leagues to the N. of it, is a ſmall round iſland, the coaſt of which is not high, but has very clean ground round it, and cloſe to it; and the bite within it is known by the name of Eucanada de Cechuſa, or bay of Cechuſa, which runs in ſo deep that this iſland is 11 leagues due W. from the town of Cechuſa, as is the Port of Payta 10 leagues and a half at N. W. from it. —*ib.*

Lobos de la Mer Iſlands, in the S. Pacific Ocean, at the diſtance of 16 leagues from the main, are two ſmall iſlands about a mile each in circumference, to the W. of one of which is a ſafe harbour, with a ſandy bottom, for ſhips to careen. They are ſo named to diſtinguiſh them from Lobos de la Terra, or near the land. But the two largeſt of thoſe which are met with under this name are 6 miles in length, and another ſmall iſland is ſaid to be to windward of the eaſternmoſt of theſe two, not half a mile in length, with rocks and breakers near the ſhore, the ſoil of which is a hungry white clay, and the important article of water is wholly wanting. But our accounts of theſe are related very imperfectly, ſo that they can only be given as they have come to our hands.—*ib.*

LOCAL PROBLEM, is one that is capable of an infinite number of different ſolutions; becauſe the point, which is to ſolve the problem, may be indifferently taken within a certain extent; as ſuppoſe any where in ſuch a line, within ſuch a plane figure, &c. which is called a *geometrical Locus.*

A local problem is *ſimple,* when the point ſought is in a right line; *plane,* when the point ſought is in the circumference of a circle; *ſolid,* when it is in the circumference of a conic ſection; or *ſurſolid,* when the point is in the perimeter of a line of a higher kind.

LOCI, the plural of

LOCUS, a line by which a local or indeterminate problem is ſolved; or a line of which any point may equally ſolve an indeterminate problem. See ALGEBRA, *Encycl.*

LOCKE, a military townſhip in New-York State, adjoining to Milton on the eaſt, ſituated in Onondago county. The centre of the town is 13 miles N. E. of the S. end of Cayuga lake.—*Morſe.*

LOCKARTSBURG, a town in Luzerne county, Pennſylvania, ſituated on an iſthmus formed by the confluence of the Suſquehannah and Tioga rivers, about a mile above their junction. There are as yet few houſes built, but it promiſes to be a place of importance, as both the rivers are navigable for many miles into the State of New-York. It is 4 miles ſouth of the New-York line, nearly 48 weſterly of Harmony, and 90 above Wilkſbarre.—*ib.*

LOGAN, a new county in the State of Kentucky. —*ib.*

LOGISTIC CURVE, the ſame with *LOGARITHMIC Curve,* for which ſee *Encycl.*

LOGISTICS, or *LOGISTICAL Arithmetic,* a name ſometimes employed for the arithmetic of ſexageſimal fractions, uſed in aſtronomical computations.

The ſame term has been uſed for the rules of computations in algebra, and in other ſpecies of arithmetic: witneſs the logiſtics of Vieta and other writers.

Shakerly, in his *Tabulæ Britannicæ,* has a table of logarithms adapted to ſexageſimal fractions, and which he calls Logiſtical Logarithms; and the expeditious arithmetic, obtained by means of them, he calls Logiſtical Arithmetic.

LOGSTOWN, on the weſtern ſide of the Ohio, lies ſouth of Butler's Town, and 18 miles from Pittſburgh.—*Morſe.*

LOGWOOD COUNTRY, lies N. W. of the Moſquito Shore, at the head of the Bay of Honduras, and extends from Vera Paz to Yucatan from 15½° to 18¼° N. lat. The whole coaſt is overſpread with iſlots, keys and ſhoals, and the navigation is intricate.—*ib.*

LONDON, a town in Ann Arundel county, Maryland, 5 miles S. W. of Annapolis.—*ib.*

LONDON COVE, a narrow water of Long-Iſland Sound, which ſets up north into the townſhip of New-London, 4 miles weſt of the mouth of Thames river.

Millſtone Point ſeparates it from another much broader on the weſt, acroſs which is a handſome bridge, with a draw at Rope Ferry.—*ib.*

LONDONDERRY, a poſt-town in Rockingham county, New-Hampſhire, ſituated near the head of Beaver river, which empties into Merrimack river, at Pawtucket Falls. It is 36 miles S. W. by W. of Portſmouth. Londonderry was ſettled in 1718, and incorporated 1722, and contains 2590 inhabitants. The people are moſtly the deſcendants of emigrants from it, came chiefly from Ulſter county in Ireland, originally from Scotland, and attend largely to the manufacture of linen cloth and thread, and make conſiderable quantities for ſale. The town is much indebted to them for its wealth and conſequence.—*ib.*

LONDONDERRY, a townſhip in Halifax county, Nova-Scotia, ſituated on the N. ſide of Cobequid or Colcheſter river, about 30 miles from its mouth, at the baſin of Minas. It was ſettled by the North Iriſh and Scotch.—*ib.*

LONDONDERRY, a townſhip, and the north-weſternmoſt of Windham county, Vermont, on the head waters of Weſt river, about 33 miles N. E. of Bennington. It was granted March 16th 1780. Mooſe Mountain extends into the eaſtern part of this town.—*ib.*

LONDONDERRY, the name of two townſhips in Pennſylvania, the one in Cheſter county, the other in that of Dauphine.—*ib.*

LONDONGROVE, a townſhip in Dauphine county, Pennſylvania.—*ib.*

LONG *Bay*, extends along the ſhore of N. and S. Carolina, from Cape Fear to the mouth of Pedee river.—*ib.*

LONG *Bay*, on the ſouth ſide of the iſland of Jamaica, extends from Gutt to Swift river, and affords anchorage for ſmall veſſels.—*ib.*

LONG *Bay*, in the iſland of Barbadoes, in the Weſt-Indies, lies on the weſt ſide of the iſland, having St Joſeph's river ſouth-eaſterly, and Pico Teneriffe north-weſterly. Another bay of the ſame name lies on the ſouth end of the iſland, about 2 miles eaſterly of the ſouth point.—*ib.*

LONG, or *Eighteen mile Beach*, on the coaſt of New-Jerſey, lies between Little Egg Harbour inlet and that of Barnegat.—*ib.*

LONG *Iſland*, formerly called *Manhattan*, afterwards *Naſſau Iſland*, belongs to the State of New-York. It extends from Hudſon's river oppoſite to Staten-Iſland, almoſt to the weſtern bounds of the coaſt of Rhode-Iſland, terminating with Montauk Point. Its length is about 140 miles, and its medium breadth not above 10 miles; and ſeparated from Connecticut by Long-Iſland Sound. It contains 1,400 ſquare miles; and is divided into 3 counties, King's, Queen's and Suffolk, and theſe again into 19 townſhips. The N. ſide of the iſland is rough and hilly. A ſingle range of theſe hills extends from Jamaica to Southhold. The ſoil is here well calculated for raiſing grain, hay, and fruit. The ſouth ſide of the iſland lies low, with a light ſandy ſoil. On the ſea-coaſt are extenſive tracts of ſalt meadow, which extend from Southampton to the weſt end of the iſland. The ſoil, notwithſtanding, is well adapted to the culture of grain, particularly Indian corn. Near the middle of the iſland is Hampſtead Plain, in Queen's county. It is 16 miles long, and about 8 broad. This plain was never known to have any natural growth, except a particular kind of wild graſs, and a few ſhrubs, although the ſoil is black, and to appearance rich. It produces ſome rye, and large herds of cattle are fed upon it, as well as on the ſalt marſhes. On the E. part of the iſland, E. of Hampſtead Plain, is a large barren heath, called Bruſhy Plain: It is overgrown with ſhrub-oak, intermixed with a few pine trees, where a number of wild deer, and grouſe harbour. The largeſt river, or ſtream in the iſland is Peakonok, an inconſiderable ſtream. It runs E. and empties into a large bay, that ſeparates Southhold from Southampton. In this bay are Robbin and Shelter iſlands. Rockonkama pond lies about the centre of the iſland, between Smith-Town and Iſlip, and is about a mile in circumference, and has been found, by obſervation, to riſe gradually for ſeveral years, until it had arrived to a certain height, and then to fall more rapidly to its loweſt bed; and thus is continually ebbing and flowing: The cauſe has never been inveſtigated. Two miles to the ſouthward of the pond, is a ſtream called Connecticut river, which empties into the bay. The produce of the middle and weſtern parts of the iſland is carried to New-York. The iſland contained, in 1790, 41,782 inhabitants, of whom 4,839 were ſlaves.—*ib.*

LONG-ISLAND *Sound* is a kind of inland ſea, from 3 to 25 miles broad, about 140 miles long, extending the whole length of the iſland, and dividing it from Connecticut. It communicates with the ocean at both ends of Long-Iſland; and affords a very ſafe and convenient inland navigation.—*ib.*

LONG-ISLAND, an iſland in Suſquehannah river.—*ib.*

LONG-ISLAND, in Holſton river, in the State of Tenneſſee, is 3 miles long. Numbers of boats are built here every year, and loaded with the produce of the State for New-Orleans. Long-Iſland is 10 miles W. of the mouth of Watauga river, 43 from Abingdon, 100 above Knoxville, 283 from Naſhville, and 1000 from the mouth of the Tenneſſee. It is 340 miles S. W. by W. of Richmond, in Virginia, and to which there is a good waggon road.—*ib.*

LONG-ISLAND, on the coaſt of S. Carolina, in N. America, is to the E. N. E. of Charles Town, and N. E. from Sullivan's Iſland, in lat. about 32° 48′ N. and long. 78° 36′ W. It is but a ſmall iſland and at a little diſtance only from the main land.—*Malham.*

LONG-ISLAND, on the N. ſide of the iſland of Antigua in the Weſt Indies, is an iſland which lies before the opening into Parham harbour, having a ſmaller iſland, called Maiden Iſland, a little to the W. of S. from it, between this iſland and a point of land of the main iſland to the weſtward of the latter iſland. It is beſet with banks and rocks from the N. W. by the N. to the E. From the weſternmoſt point of the iſland a ſand bank runs to the N. W. for half a league nearly, ſo that ſhips muſt keep at that diſtance from the ſaid point, and at leaſt 2 miles at N. W. from Maiden Iſland, before they attempt to go in on that courſe for the latter iſland. By this courſe they will come thwart of the weſternmoſt point of Long-Iſland, about half a mile ſhort of Maiden Iſland, and thereby avoid a ſhoal which runs out from the main iſland towards the N. E. as well as this bank from the point in the direction of N. W. which has but from 2 to 6 feet upon it.—*ib.*

LONG ISLE, or *Iſle River Indians*, inhabit on Iſle, or White river, which runs weſterly into the river Wabaſh. The mouth of White river is in N. lat. 38° 58′ W. long. 90° 7′.—*Morſe.*

LONG LAKE, in the Geneſſee country in New-York.—*ib.*

LONG-MEADOW, a town in Hampſhire county, Maſſachuſetts, ſituated on the E. bank of Connecticut river, about 4 miles S. of Springfield, and 23 N. of Hartford. It was incorporated in 1783; contains a Congregational church, and about 70 dwelling houſes, which lie upon one wide ſtreet, running parallel with the river. The townſhip contains 744 inhabitants. It is 97 miles S. W. by W. of Boſton.—*ib.*

LONG POINT, a peninſula on the N. ſide of Lake Erie, and towards the eaſtern end of the lake. It is compoſed of ſand, and is very convenient to haul boats out of the ſurf upon, when the lake is too rough for rowing or ſailing. *Vermilion Point*, between Puan Bay and Lake Michigan, is alſo called Long Point in ſome maps.—*ib.*

LONG POND, in the Diſtrict of Maine, lies moſtly in Bridgton, and is 10 miles long from N. W. to S. E. and about a mile broad. On each ſide of this pond are large ſwells of excellent land, with a gradual deſcent to the margin of the pond, and furniſh a variety of romantic proſpects.—*ib.*

LONGUEY BAY, on the coaſt of Chili on the W. coaſt of South America, ſometimes called Tonguey or Tonguay, is 10 leagues to the N. from Limari, and in lat. 30° 30′ S. In the road is a headland oppoſite to a ſmall river, where is good watering; and there is good anchorage all over the bay, and clean holding ground. This bay may be certainly known by the hill called Sierra del Guanaquero, and by a low point running out, called Lengua de Vacca, the Cow's Tongue, which cloſe the bay to weſtward. This coaſt, though indifferently high, ſo as to be ſeen at 25 or 30 leagues off at ſea, makes at firſt as if it was all drowned, becauſe the mountains of the Cordilleras that appear over it, are always covered with ſnow. It is 7 leagues from hence to Herradura or Horſe Shoe Point to the ſouthward of Coquimbo.—*Malham.*

LONGUILLE, or as the Indians call it, *Kenapacomaqua*, an Indian village on the N. bank of Eel river, in the N. W. Territory. It was deſtroyed by Gen. Scott in 1791, with 200 acres of corn in its neighbourhood.—*Morſe.*

LOOKOUT, *Cape*, on the coaſt of N. Carolina, is the ſouthern point of a long inſulated and narrow ſlip of land, eaſtward of Core Sound. Its N. point forms the S. ſide of Ocrecock inlet, which leads into Pamlico Sound. It lies N. E. of Cape Fear, and S. of Cape Hatteras, in about latitude 34° 50′. It had an excellent harbour, which has been filled up with ſand ſince the year 1777.—*ib.*

Lookout, *Cape*, on the ſouthern coaſt of Hudſon's Bay, in New South Wales, E. S. E. of the mouth of Severn river. N. lat. 56°, W. long. 84°.—*ib.*

LORENZO, *Cape St*, on the coaſt of Peru, S. America, lies in the province of Quito, W. of the city of that name. S. lat. 0° 20′, W. long. 80° 20′.—*ib.*

Lorenzo *Iſland*, on the W. coaſt of South America, on the ſouth Atlantic Ocean, is above 2 miles to the W. of the cape at Callao, being about 4 miles long from N. W. to S. E. and near 2 broad in the broadeſt part. A very ſmall iſland, called La Laja, lies in the midway between them, having only a depth of from 9 to 12 feet on its E. ſide towards the cape, on the N. ſide 4 fathoms, and on the W. ſide towards Lorenzo ſtill more water. There is generally from 7 to 17 fathoms round this iſland; off the S. E. end of which is Fronton Iſland, having from 5 fathoms and a half to 14 fathoms round it, and between the iſlands ſome ſmall rocks. There are alſo ſeveral ſmall iſlands, called Palominos, about 3 miles on the W. of Lorenzo Iſland, having from 13 to 18 fathoms round them. —*Malham.*

LORETTO, a ſmall village of Chriſtian Indians, 3 leagues N. E. of Quebec, in Canada. It has its name from a chapel built according to the model of the Santa Caſa at Loretto, in Italy; from whence an image of the Holy Virgin has been ſent to the converts here, reſembling that in the famous Italian ſanctuary. Theſe converts are of the Huron tribe.—*Morſe.*

Loretto, *Lady of*, a place in the diſtrict of St Dennis, on the iſthmus of California; the Indians call it *Cancho*. Here is a ſmall fort erected by the miſſionaries, conſiſting of four baſtions, and ſurrounded by a deep ditch.

LORINCHINCA, on the coaſt of Peru, in South America, and on the S. Pacific Ocean, is about midway between Piſco and Chinca, or 3 leagues from each, and has a tolerable good road, with a fair ſtrand on the ſhore. But there runs a great ſea on this coaſt. Ships may anchor in 6 fathoms before a houſe that will be ſeen on the ſhore near a white church; this houſe is known by the name of El Molino, or the Mill.—*Malham.*

LOROMIE'S STORE, in the territory N. W. of the Ohio, a place weſterly from Fort Lawrence, and at or near a fork of a branch of the Great Miami river, which falls into the Ohio. At this ſpot, bounded W. by the Indian line, the Indians ceded a tract of land to the United States, 6 miles ſquare, by the treaty ſigned Auguſt 3, 1795. Here the portage commences between the Miami of the Ohio, and St Mary's river, which runs into Lake Erie.—*Morſe.*

LOS REYES, the chief town of the province of Uragua, in the E. diviſion of Paraguay, in S. America.—*ib.*

LOS CHARCOS, a province in the ſouthern diviſion of Peru, whoſe chief cities are Potoſi and Porco.—*ib.*

Libyan LOTUS has been deſcribed (*Encycl.*) under the title Rhamnus; but the following additional particulars from Mr Park will be acceptable to our botanical readers:

The lotus is very common in all the countries which our author viſited, and he had an opportunity to make a drawing of a branch in flower, of which an engraving is publiſhed in his travels, that with his permiſſion we have copied (ſee Plate XXX.). The lotus produces fruit which the negroes call *tomberongs*. Theſe are ſmall farinaceous berries, of a yellow colour and delicious taſte. They are much eſteemed by the natives, who convert them into a ſort of bread, by expoſing them for ſome days to the ſun, and afterwards pounding them gently in a wooden mortar, until the farinaceous part of the berry is ſeparated from the ſtone. This meal is then mixed with a little water, and formed into cakes; which, when dried in the ſun, reſemble in colour and flavour the ſweeteſt gingerbread. The ſtones are afterwards put into a veſſel of water, and ſhaken about ſo as to ſeparate the meal which may ſtill adhere to them: this communicates a ſweet and agreeable taſte to the water, and with the addition of a little pounded millet, forms a pleaſant gruel called *fondi*, which is the common breakfaſt in many parts of Ludamar, during the months of February and March. The fruit is collected by ſpreading a cloth upon the ground, and beating the branches with a ſtick. Our author thinks there can be little doubt of this being the lotus mentioned by Pliny, as the food of the Lybian Lotophagi. An army may very well have been fed with the bread made of the meal of the fruit, as is ſaid by Pliny to have been done in Lybia; and as the taſte of the bread is ſweet and agreeable, it is not likely that the ſoldiers would complain of it.

LOUDON, a county of Virginia, on the river Potowmac, adjoining Fairfax, Berkley, and Faquier counties. It is about 50 miles long, and 20 broad, and contains 18,962 inhabitants, including 4,030 ſlaves. Chief town, Leeſburg.—*Morſe.*

Loudon, a townſhip in Rockingham county, New-Hampſhire, taken from Canterbury townſhip and incorporated in 1773. It is ſituated on the E. ſide of Merrimack river, and contains 1084 inhabitants.—*ib.*

Loudon, a townſhip in Berkſhire county, Maſſachuſetts, 21 miles S. E. of Lenox, 24 W. of Springfield, and 124 W. of Boſton. It was incorporated in 1773, and contains 344 inhabitants. It contains 13,000 acres, of which 2,944 are ponds.—*ib.*

LOUGHABER, or *Lochaber*, a ſmall ſettlement in Georgia, on a branch of Savannah river, above its confluence with the Tugulo, the W. main branch.—*ib.*

LOUIS, *Fort*, a ſettlement formed by the French near the mouth of the river Coza, in Florida, about 20 leagues N. E. of the neareſt mouth of the Miſſiſſippi, and until the peace of 1763, was the uſual reſidence of the principal governor of Louiſiana.—*ib.*

LOUIS DE MARANHAM, St, a town on the northern coaſt of Brazil, and on the Atlantic ocean, ſituated on the eaſt ſide of Mearim river; about half way between point Mocoripe, and the mouth of the river Para.—*ib.*

Louis, St, a juriſdiction and town on the ſouth ſide of the iſland of St Domingo. The juriſdiction contains 3 pariſhes. Its exports ſhipped from the town of St Louis from Jan. 1, 1789 to Dec. 31, of the ſame year, were 120,665 lb. coffee; 19,253 lb. cotton; 5,751 lb. indigo. Total value of duties on exportation, 904 dollars 13 cents. St Louis is rather a borough than a town. It is ſituated on the head of the bay of its name, oppoſite a number of ſmall iſles which ſhelter the bay on the ſouth towards the ocean, and on the S. ſide of the ſouth peninſula, 8 leagues N. E. of Les Cayes, a little more than 3 S. W. of Aquin, and 36 leagues S. W. by W. of Port au Prince: from which laſt are two roads leading to it; the one by Jacmel the other by Leogane, and of much the ſame length; both join at Aquin. N. lat. 18° 18′, W. long. from Paris, 75° 52′.—*ib.*

Louis, St, a ſmall, compact, beautiful bay in Weſt-Florida, having about 7 feet water. It is 18 miles from the Regolets, and 26 from the bay of Biloxi. The land near it is of a light ſoil, and good for paſture. There were ſeveral ſettlers formerly on it, but in the year 1767, the Chactaw Indians killed their cattle and obliged them to remove.—*ib.*

Louis, St, a Spaniſh village on the W. ſide of the river Miſſiſſippi, about 13 miles below the mouth of the Miſſouri. Its ſcite is on a high piece of ground, the moſt healthy and pleaſurable of any known in this part of the country. Here the Spaniſh commandant and the principal Indian traders reſide; who, by conciliating the affections of the natives, have drawn all the Indian trade of the Miſſouri; part of that of the Miſſiſſippi (northwards) and of the tribes of Indians reſiding near the Ouiſconſing, and Illinois rivers, to this village. About 20 years ago there were here 120 large and commodious houſes, moſtly built of ſtone, and 800 inhabitants, chiefly French. Some of them have had a liberal education, and were polite and hoſpitable. They had about 150 negroes, and large ſtocks of cattle, &c. It is 4 or 5 miles N. by W. of Cahokia, on the eaſt ſide of the Miſſiſſippi, and about 150 miles W. by S. of Poſt St Vincent's on Wabaſh river. N. lat. 38° 24′, W. long. 92° 32′.—*ib.*

LOUISA, a county of Virginia, adjoining Orange, Albemarle, Fluvanna, Spottſylvania, and Goochland counties. It is about 35 miles long, and 20 broad, and contains 8,467 inhabitants, including 4,573 ſlaves. There are here ſome medicinal ſprings, on the head waters of South Anna, a branch of York river; but they are little frequented.—*ib.*

Louisa, a river of Virginia, the head water of Cole river, a S. W. branch of the Great Kanhaway.—*ib.*

LOUSA CHITTO, or *Looſa Chitto*, a river which riſes on the borders of S. Carolina, and runs a S. weſterly courſe through the Georgia weſtern lands, and joins the Miſſiſſippi juſt below the Walnut Hills, and 10 miles from Stony river. It is 30 yards wide at its mouth, but after you enter it, is from 30 to 40 yards, and is ſaid to be navigable for canoes 30 or 40 leagues. It is 39¾ miles below the Yazoo cliffs.—*ib.*

LOUISBOURG, the capital of Sydney, or Cape Breton iſland, in North-America. Its harbour is one of the fineſt in that country, being almoſt 4 leagues in circuit, and 6 or 7 fathoms water in every part of it. The anchorage or mooring, is good, and ſhips may run aground without any danger. Its entrance is not above 300 toiſes in breadth, formed by two ſmall iſlands, and is known 12 leagues off at ſea, by Cape Lorembec, ſituated near the N. E. ſide of it. Here is plenty of cod, and the fiſhery may be continued from April to the cloſe of November. The harbour is more than half a mile in breadth, from N. W. to S. E. in the narroweſt part; and 6 miles in length, from N. E. to S. W. In the N. E. part of the harbour is a fine careening wharf to heave down, and very ſecure from all winds. On the oppoſite ſide are the fiſhing ſtages, and room for 2000 boats to cure their fiſh. In winter the harbour is entirely frozen up, ſo as to be walked over, which ſeaſon begins here at the cloſe of November,

vember, and laſts till May or June; ſometimes the froſts ſet in ſooner, and are more intenſe; as particularly in 1745, when by the middle of October a great part of the harbour was already frozen. The town of Louiſbourg ſtands on a point of land, on the S. E. ſide of the iſland; its ſtreets are regular and broad, conſiſting for the moſt part of ſtone houſes, with a large parade at a little diſtance from the citadel; the inſide of which is a fine ſquare, near 200 feet every way. On its N. ſide, while poſſeſſed by the French, ſtood the governor's houſe and the church: the other ſides were taken up with barracks, bomb proof; in which the French ſecured their women and children during the ſiege. The town is near half a mile in length, and 2 in circuit. The principal trade of Louiſbourg is the cod fiſhery, from which vaſt profits accrue to the inhabitants; the plenty of fiſh being remarkable, and at the ſame time better than any about Newfoundland. N. latitude 45° 54′, weſt longitude 59° 55′. —*ib.*

LOUISIANA, a Spaniſh province of North-America, bounded E. by the Miſſiſſippi, S. by the gulf of Mexico, W. by New-Mexico, and N. by undefined boundaries. Both ſides of the Miſſiſſippi were under the French government till the peace of 1762; when the eaſtern ſide was ceded to the king of Great Britain; and the day before the preliminaries of peace were ſigned, his Chriſtian Majeſty ceded to Spain all his territories to the weſtward of the Miſſiſſippi, together with the town of New Orleans; with a ſtipulation that the French laws and uſages ſhould not be altered: this precaution, however, proved afterwards of no avail.

Louiſiana is interſected by a number of fine rivers, among which are St Francis, the Natchitoches, the Adayes, or Mexicano river, the Miſſouri, Rouge, Noir, and many others which are deſcribed under their reſpective names. The greater part of the white inhabitants are Roman Catholics. They are governed by a viceroy from Spain. The number of inhabitants is unknown. The quantity of good land on the Miſſiſſippi and its branches, from the bay of Mexico to Ohio river, a diſtance of nearly 1000 miles, is very great; but that in the neighbourhood of the Natchez, and of the river Yazoo, is the flower of it all. There have been ſome plantations of ſugar canes; but it is not a crop to be depended upon, as the froſt has ſometimes been too powerful for that plant. The chief articles of exportation are indigo, cotton, rice, beans, myrtle wax, and lumber.

The climate is ſaid to be favourable for health and to the culture of fruits of various kinds, and particularly for garden vegetables. Iron and lead mines and ſalt ſprings, it is aſſerted, are found in ſuch plenty as to afford an abundant ſupply of theſe neceſſary articles. The banks of the Miſſiſſippi, for many leagues in extent, commencing about 20 miles above the mouth of Ohio, are a continued chain of lime-ſtone. A fine tract of high, rich, level land, S. W. W. and N. W. of New-Madrid, about 25 miles wide, extends quite to the river St Francis.

While the United States were engaged in the revolution war againſt England, the Spaniards attacked and poſſeſſed themſelves of all the Engliſh poſts and ſettlements on the Miſſiſſippi, from the Ibberville up to the Yazoo river, including the Natchez country; and by virtue of this conqueſt have ſince peopled and governed an extent three degrees north of the United States ſouth boundary, claiming the excluſive navigation of the other. This buſineſs has been amicably ſettled by the treaty of 1796.

The Miſſiſſippi, on which the fine country of Louiſiana is ſituated, was firſt diſcovered by Ferdinand de Soto, in 1541. Monſieur de la Salle was the firſt who traverſed it. He, in the year 1682, having paſſed down to the mouth of the Miſſiſſippi, and ſurveyed the adjacent country, returned to Canada, from whence he took paſſage to France. From the flattering accounts which he gave of the country, and the conſequent advantages that would accrue from ſettling a colony in thoſe parts, Louis XIV. was induced to eſtabliſh a company for the purpoſe. Accordingly, a ſquadron of four veſſels, amply provided with men and proviſions, under the command of Monſieur de la Salle, embarked with an intention to ſettle near the mouth of the Miſſiſſippi. But he unintentionally ſailed a hundred leagues to the weſtward of it, where he attempted to eſtabliſh a colony; but, through the unfavourableneſs of the climate, moſt of his men miſerably periſhed, and he himſelf was villanouſly murdered, not long after, by two of his own men. Monſieur Ibberville ſucceeded him in his laudable attempts. He, after two ſucceſsful voyages, died while preparing for a third. Crozat ſucceeded him; and in 1712, the king gave him Louiſiana. This grant continued but a ſhort time after the death of Louis XIV. In 1763, Louiſiana was ceded to the king of Spain, to whom it now belongs.—*ib.*

LOUISTOWN, in Talbot county, Maryland, lies on the weſt ſide of Tuckahoe creek, about 4 miles north of King's Town, and 7 or 8 north-eaſt of Eaſton.—*ib.*

LOUISVILLE, the preſent ſeat of government of Georgia, ſituated in Burke county, in the lower diſtrict of the State, on the N. E. bank of the Great Ogeechee river, 70 miles from its mouth. It has been lately laid out, and contains a ſtate-houſe, a tobacco warehouſe, and about 30 dwelling-houſes. Large quantities of tobacco are inſpected here, and boated down to Savannah. The convention for the reviſal of the conſtitution ſat in this town in May, 1795, and appointed the records to be removed, and the legiſlature to meet here in future. A college, with ample and liberal endowments, is inſtituted here. It is 52 miles S. E. of Auguſta, and 100 N. W. of Savannah.—*ib.*

LOUISIADE, *Land of*, diſcovered and named by Bougainville in 1768, is probably a chain of iſlands, forming a ſouth-eaſtern continuation of New Guinea. The coaſt ſeen by the Dutch *Geelwink* Yacht in 1705, is a ſmall diſtance north of Louiſiade.—*ib.*

LOVE-COVE, a fine opening to the weſtward of Whale Cove, in New North Wales.—*ib.*

LOVELL's POND, in New-Hampſhire, lies at the head of the eaſtern branch of Salmon Fall river.—*ib.*

LOWANG, a Chineſe iſland of ſome extent in the neighbourhood of the CHUSAN-Iſles, which ſee in this *Supplement*. Some of the gentlemen belonging to the Britiſh embaſſy went aſhore on Lowang, which they deſcribed as naked both of trees and of cattle. They examined particularly a ſmall level plain recovered from the ſea, which was kept out by an embankment of earth, at leaſt thirty feet thick. The quantity of ground gained by it ſeemed ſcarcely to be worth the labour that it muſt have coſt. The plain was indeed cultivated with the utmoſt care, and laid out chiefly in rice-plats, ſupplied with water collected from the adjacent hills into little channels, through which it was conveyed to every part of thoſe plantations. It was manured, inſtead of the dung of animals, with matters more offenſive to the human ſenſes, and which are not very generally applied to the purpoſes of agriculture in England. Earthen veſſels were ſunk into the ground for the reception of ſuch manure; and for containing liquids of an analogous nature, in which the grain was ſteeped previouſly to its being ſown; an operation which is ſuppoſed to haſten the growth of the future plant, as well as to prevent any injury from inſects in its tender ſtate.

The party fell in with a peaſant who, though ſtruck with their appearance, was not ſo ſcared by it as to ſhun them. He was dreſſed in looſe garments of blue cotton, a ſtraw hat upon his head faſtened by a ſtring under his chin, and half boots upon his legs. He ſeemed to enter into the ſpirit of curioſity, naturally animating travellers, and readily led them towards an adjoining village. Paſſing by a ſmall farm houſe, they were invited into it by the tenant, who, together with his ſon, obſerved them with aſtoniſhed eyes. The houſe was built of wood, the uprights of the natural form of the timber. No ceiling concealed the inſide of the roof, which was put together ſtrongly, and covered with the ſtraw of rice. The floor was of earth beaten hard, and the partitions between the rooms conſiſted of mats hanging from the beams. Two ſpinning wheels for cotton were ſeen in the outer room; but the ſeats for the ſpinners were empty. They had probably been filled by females, who retired on the approach of ſtrangers; while they remained, none of that ſex appeared. Round the houſe were planted cluſters of bamboo, and of that ſpecies of palm, of which each leaf reſembles the form of a fan; and, uſed as ſuch, becomes an article of merchandize.

LOWER ALLOWAY'S *Creek*, a townſhip in Salem county, New-Jerſey.—*Morse.*

LOWER DUBLIN, a townſhip in Philadelphia county, Pennſylvania.—*ib.*

LOWER MILFORD, a townſhip in Buck's county, Pennſylvania.—*ib.*

LOWER MARLBOROUGH, a poſt-town in Maryland, 30 miles from Annapolis, and 12 from Calvert court-houſe.—*ib.*

LOWER PENN'S *Neck*, a townſhip in Salem county, New-Jerſey.—*ib.*

LOWER WEAU *Towns*, in the Territory N. W. of the Ohio, lie 20 miles below Rippacanoe creek, at its mouth in Wabaſh river.—*ib.*

LOWHILL, a townſhip in Northampton county, Pennſylvania.—*ib.*

LOXA, a town of Quito in Peru, at the head of a N. W. branch of Amazon river, 215 miles north-eaſt of Paita, and north-weſterly of Borja. It is the capital of a juriſdiction of the ſame name, and lies in lat. 5° 10′ S. long. 77° 10′ W. Beſides 2 churches, it has ſeveral religious foundations; as, a college inſtituted by the Jeſuits, an hoſpital, with 14 villages in its diſtrict. The juriſdiction of the ſame name produces the famous ſpecific for intermittent fevers, called Caſcarilla de Logo Quinquina, or Jeſuit's bark. Of it there are ſeveral kinds, but one more efficacious than the others. Here alſo they are employed in breeding cochineal. The inhabitants of Loja, called alſo Lojanus, do not exceed 10,000 ſouls, though formerly far more numerous. Large droves of horned cattle and mules are bred here. Carpets are alſo manufactured here of remarkable fineneſs.—*ib.*

LOXODROMIC CURVE, or *Spiral*, is the ſame as the rhumb line, or path of a ſhip ſailing always on the ſame courſe in an oblique direction, or making always the ſame angle with every meridian. It is a ſpecies of logarithmic ſpiral, deſcribed on the ſurface of the ſphere, having the meridians for its radii.

LOXODROMICS, the art or method of oblique ſailing, by the loxodromic or rhumb line.

LOYALSOCK *Creek*, in Northumberland county, Pennſylvania, empties into the W. ſide of the branch of Suſquehannah river, from the north-eaſt, a few miles E. of Lycoming Creek, 26 from Sunbury, meaſuring in a ſtraight line, and about 170 from Philadelphia. The lands from this to Sunbury are among the higheſt and of the beſt quality, and in the healthieſt ſituation in the State. It is navigable 20 or 30 miles up for batteaux of 10 tons.—*Morse.*

LUCANAS, a juriſdiction in the dioceſe of Guamanga, in Peru. It begins about 25 or 30 leagues S. W. of Guamanga. Its temperature is cold and moderate. It abounds with cattle, grain and fruit; and has alſo ſilver mines; and is the centre of a very large commerce.—*ib.*

LUCAR, *Fort St*, lies on the north-eaſt coaſt of Brazil; about half way between the city of Scara and Rio Grande.—*ib.*

LUCAR, CAPE ST, or *Lucas.* The S. E. end of the peninſula of California is ſo named.—*ib.*

LUCAYA, one of the Bahama Iſlands, about 70 leagues eaſt of the coaſt of Florida, and 6 from Bahama Iſle. It is about 9 leagues long and 2 broad, and gives name to the whole range. N. lat. 27° 27′, W. long. 78° 5′.—*ib.*

LUCAYONEQUE, another of the Bahama iſles, which lies about 9 leagues further eaſt than the former; whoſe length is 28 leagues and breadth 3, and lies north and ſouth.—*ib.*

LUCIA, ST, a river of Eaſt-Florida, runs ſouth-eaſterly along the eaſt ſide of the peninſula; and communicates inland with Indian river. It has 6 feet water as far as the Tortolas, where are hilly knowls. A branch joins it from the ſouth.—*ib.*

LUCIA, ST, called by the French, Sainte Alouſie, from its having been diſcovered on St Lucia's Day; one of the Caribbee Iſlands, 6 leagues ſouth of Martinico, and 21 N. W. of Barbadoes. It is about 27 miles long from north to ſouth, and 12 broad. Here are ſeveral hills, 2 of which being very round and ſteep, are called the Pins heads of St Lucy, and were volcanoes. At the foot of them are fine vallies, having a good ſoil and well watered. In theſe are tall trees, with the timber of which the planters of Martinico and Barbadoes build their houſes and wind-mills. Here is alſo plenty of cocoa and fuſtic. The air is reckoned healthy, the hills not being ſo high as to intercept the trade-winds, which always fan it from the eaſt by which means the heat of the climate is moderated and rendered agreeable.

In St Lucia are ſeveral commodious bays and harbours, with good anchorage, particularly the Little Careenage, one of the principal inducements for the French to prefer it to the other neutral iſlands. This port has ſeveral noted advantages; there is every where depth enough, and the quality of the bottom is excellent. Nature has formed there three careening places, which do not want a key, and require nothing but a capſtern to turn the keel above ground. Thirty ſhips of the line might lie there ſheltered from hurricanes, without the trouble of being moored. The boats of the country, which have been kept a long time in this harbour, have never been eaten by the worms; however, they do not expect that this advantage will laſt, whatever be the cauſe. For the other harbours, the winds are always good to go out with, and the largeſt ſquadron might be in the offing in leſs than an hour. There are 9 pariſhes in the iſland, 8 to the leeward, and only one to the windward. This preference given to one part of the iſland more than another, does not proceed from the ſuperiority of the ſoil, but from the greater or leſs conveniency in ſending out or receiving ſhips. A high road is made round the iſland, and two others which croſs it from eaſt to weſt, afford all manner of facilities to carry the commodities of the plantations to the barcaderes, or landing places.

In January, 1769, the free inhabitants of the iſland amounted to 2,524; the ſlaves to 10,270. It had in cattle 598 mules and horſes, 1,819 horned beaſts, and 2,378 ſheep. Its plantations were 1,279,680 plants of cocoa—2,463,880 of coffee—681 ſquares of cotton—and 254 of ſugar canes; there were 16 ſugar-works going on, and 18 nearly completed. Its produce yielded £112,000, which by improvement might be increaſed to £500,000. The Engliſh firſt ſettled in this iſland in 1637. From this time they met with various misfortunes from the natives and French; and at length it was agreed on between the latter and the Engliſh, that this iſland, together with Dominica and St Vincent, ſhould remain neutral. But the French, before the war of 1756 broke out, began to ſettle theſe iſlands, which by the treaty of peace were yielded up to Great-Britain, and this iſland to France. The Britiſh made themſelves maſter of it in 1778; but it was reſtored again to the French in 1783; and retaken by the Britiſh in 1794. St Lucia had 900 of its inhabitants deſtroyed by an earthquake, Oct. 12, 1788. It is 63 miles N. W. of Barbadoes. N. lat. 14°, W. long. 61°.—*ib.*

LUCIOLE, a name given in the *Annales de Chimie* to the *Lampyris Italica* (See Lampyris, *Encycl.*). According to Dr Carradori, the light of the luciole does not depend on the influence of any external cauſe, but merely on the will of thoſe inſects. While they fly about at freedom, their ſhining is very regular; but when they are once in our power, they ſhine very irregularly, or do not ſhine at all. When they are moleſted, they emit a frequent light, which appears to be a mark of their reſentment. When placed on their backs, they ſhine almoſt without interruption, making continual efforts to turn themſelves from that poſition. In the daytime it is neceſſary to torment them in order to make them ſhine; and thence it follows, that the day to them is the ſeaſon of repoſe. The luciole emit light at pleaſure from every point of their bellies, which proves that they can move all the parts of their viſcera independently of each other. They can alſo render their phoſphoreſcence more or leſs vivid, and continue it as long as they pleaſe.

A ſlight compreſſion deprives the luciole of their power of ceaſing to ſhine. The author is inclined to believe, that the movement by which they conceal their light is executed by drawing back their phoſphoric ſubſtance into a particular membrane or tunic. He ſuppoſes alſo, that the ſparkling conſiſts in a trembling or oſcillation of the phoſphoric maſs. He is of opinion, that there is no emanation of a phoſphoric ſubſtance, and that the whole phenomenon takes place in the interior part of the luminous viſcera. When the ſhining is at its greateſt degree of height, it is ſo ſtrong that a perſon may by it eaſily diſtinguiſh the hours on the ſmalleſt watch, and the letters of any type whatever.

The phoſphoric part of the luciole does not extend farther than to the extreme rings of the belly. It is there incloſed in a covering compoſed of two portions of membranes, one of which forms the upper, and the other the lower, part of the belly, and which are joined together. Behind this receptacle is placed the phoſphorus, which reſembles a paſte, having the ſmell of garlic, and very little taſte. The phoſphoric matter iſſues from a ſort of bag on the ſlighteſt preſſure; when ſqueezed out, this matter loſes its ſplendour in a few hours, and is converted into a white dry ſubſtance. A portion of the phoſphoric belly put into oil, ſhone only with a feeble light, and was ſoon extinguiſhed. In water, a like portion ſhone with the ſame vivacity as in the air, and for a much longer time. The author thence concludes, that the phoſphoreſcence of the luciole is not the effect of ſlow inflammation, nor of the fixation of azotic gas, as the oil in which they ſhine does not contain a ſingle air-bubble: beſides, the phoſphorus of theſe inſects ſhines in a barometrical vacuum. The obſervation made by Foſter, that the luciole diffuſed a more vivid light in oxygen gas than in atmoſpheric air, does not, according to Carradori, depend upon a combuſtion more animated by the inſpiration of this gas, but on the animals feeling themſelves, while in that gas, in a better condition. "Whence, then, ariſes (ſays the author) the phoſphoric light of the luciole? I am of opinion (adds he), that the light is peculiar and innate in theſe inſects, as ſeveral other productions are peculiar to other animals. As ſome animals have the faculty of accumulating the electric fluid, and of keeping it condenſed in particular organs, to diffuſe it afterwards at pleaſure, there may be other animals endowed with the faculty of keeping in a condenſed ſtate the fluid which conſtitutes light. It is poſſible, that by a peculiar organization they may have the power of extracting the light which enters into the compoſition of their food, and of tranſmitting it to the reſervoir deſtined for that purpoſe, which they have in their abdomen. It is not even impoſſible that they may have the power to extract from the atmoſpheric air the luminous fluid, as other animals have the power of extracting from the ſame air, by a chemical proceſs, the fluid of heat."

Carradori diſcovered, that the phoſphoreſcence of the
luciole

luciole is a property independent of the life of theſe animals, and that it is chiefly owing to the ſoft ſtate of the phoſphoric ſubſtance. Its light is ſuſpended by drying, and it is again revived by ſoftening it in water; but only after a certain time of deſiccation. Reaumur, Beccaria, and Spallanzani, obſerved the ſame thing in regard to the *pholades* and the *meduſa*.

By plunging the luciole alternately into lukewarm and cold water, they ſhine with vivacity in the former, but their light becomes extinct in the latter; which, according to the author, depends on the alternate agreeable and diſagreeable ſenſation which they experience. In warm water their light diſappears gradually. Dr Carradori tried on the luciole and their phoſphorus the action of different ſaline and ſpirituous liquors, in which they exhibited the ſame appearances as other phoſphoric animals. Theſe laſt experiments prove that the phoſphoric matter of the luciole is only ſoluble in water.

LUDAMAR, a Mooriſh kingdom in the interior of Africa, of which the capital Benorm is placed by Major Rennel in 15° N. Lat. and 6° 50′ W. Long. It has for its northern boundary the great deſert (ſee SAHARA in this *Supplement*), and is deſcribed by Mr Park as little better than a deſert itſelf. Our traveller was taken captive on the confines of this kingdom, and carried to the camp of the king, where he was ſubjected to the crueleſt indignities that the malice of bigotted Moors could invent. He was not ſuffered to travel beyond the camp; though he moved as it moved, and of courſe ſaw a conſiderable part of the country, and had an opportunity of obſerving the manners of the people. "The Moors of Ludamar ſubſiſt chiefly on the fleſh of their cattle; and are always in the extreme of either gluttony or abſtinence. In conſequence of the frequent and ſevere faſts which their religion enjoins, and the toilſome journeys which they ſometimes undertake acroſs the deſert, they are enabled to bear both hunger and thirſt with ſurpriſing fortitude; but whenever opportunities occur of ſatisfying their appetite, they generally devour more at one meal than would ſerve an European for three. They pay but little attention to agriculture; purchaſing their corn, cotton cloth, and other neceſſaries, from the Negroes, in exchange for ſalt, which they dig from the pits in the Great Deſert.

"The natural barrenneſs of the country is ſuch, that it furniſhes but few materials for manufacture. The Moors, however, contrive to weave a ſtrong cloth, with which they cover their tents; the thread is ſpun by their women from the hair of goats: and they prepare the hides of their cattle ſo as to furniſh ſaddles, bridles, pouches, and other articles of leather. They are likewiſe ſufficiently ſkilful to convert the native iron, which they procure from the Negroes, into ſpears and knives, and alſo into pots for boiling their food; but their ſabres and other weapons, as well as their fire-arms and ammunition, they purchaſe from the Europeans, in exchange for the Negro ſlaves which they obtain in their predatory excurſions. Their chief commerce of this kind is with the French traders on the Senegal river."

The Moors of this country have ſingular ideas of feminine perfection. The gracefulneſs of figure and motion, and a countenance enlivened by expreſſion, are by no means eſſential points in their ſtandard; with them corpulence and beauty appear to be terms nearly ſynonymous. A woman, of even moderate pretenſions, muſt be one who cannot walk without a ſlave under each arm to ſupport her; and a perfect beauty is a load for a camel. In conſequence of this prevalent taſte for unwieldineſs of bulk, the Mooriſh ladies take great pains to acquire it early in life; and for this purpoſe many of the young girls are compelled by their mothers to devour an immenſe quantity of food, and drink a large bowl of camel's milk every morning. It is of no importance whether the girl has an appetite or not, the meat and the drink muſt be ſwallowed; and obedience is frequently enforced by blows. This ſingular practice, inſtead of producing indigeſtion and diſeaſe, ſoon covers the young lady with that degree of plumpneſs, which, in the eye of a Moor, is perfection itſelf.

"Although the wealth of the Moors conſiſts chiefly in their numerous herds of cattle; yet, as the paſtoral life does not afford full employment, the majority of the people are perfectly idle, and ſpend the day in trifling converſation about their horſes, or in laying ſchemes of depredation on the Negro villages.

"The uſual place of rendezvous for the indolent is the king's tent, where great liberty of ſpeech ſeems to be exerciſed by the company towards each other. While in ſpeaking of their chief, they expreſs but one opinion. In praiſe of their ſovereign, they are unanimous. Songs are compoſed in his honour, which the company frequently ſing in concert; but they are ſo loaded with groſs adulation, that no man but a Mooriſh deſpot could hear them without bluſhing. The king is diſtinguiſhed by the fineneſs of his dreſs, which is compoſed of blue cotton cloth brought from Tombuctoo, or white linen or muſlin from Morocco. He has likewiſe a larger tent than any other perſon, with a white cloth over it; but in his uſual intercourſe with his ſubjects, all diſtinctions of rank are frequently forgotten. He ſometimes eats out of the ſame bowl with his camel driver, and repoſes himſelf, during the heat of the day, upon the ſame bed.

"The military ſtrength of Ludamar conſiſts in cavalry. They are well mounted, and appear to be very expert in ſkirmiſhing and attacking by ſurpriſe. Every ſoldier furniſhes his own horſe, and finds his accoutrements, conſiſting of a large ſabre, a double barrelled gun, a ſmall red leather bag for holding his balls, and a powder horn ſlung over the ſhoulder. He has no pay, nor any remuneration but what ariſes from plunder. This body is not very numerous; for when Ali the king made war upon Bambara, our author was informed that his whole force did not exceed 2000 cavalry. They conſtitute, however, by what he could learn, but a very ſmall proportion of his Mooriſh ſubjects. The horſes are very beautiful, and ſo highly eſteemed, that the Negro princes will ſometimes give from twelve to fourteen ſlaves for one horſe."

Cut off from all intercourſe with civilized nations, and boaſting an advantage over the Negroes, by poſſeſſing, though in a very limited degree, the knowledge of letters, the Moors of Ludamar are at once the vaineſt and proudeſt, and perhaps the moſt bigotted, ferocious, and intolerant of all the nations on the earth; combining in their character the blind ſuperſtition of the Negro with the ſavage cruelty and treachery of the Arab. It was with the utmoſt difficulty that our author made his eſcape from this inhoſpitable people.

LUDLOW, a townſhip in Hampſhire county, Maſſachuſetts, ſouth of Granby, 10 miles north-eaſterly of Springfield, and 90 weſterly of Boſton. It was incorporated in 1784, and contains 560 inhabitants.—*Morse.*

Ludlow, a townſhip on Black river, Windſor county, Vermont. It contains 179 inhabitants, and is about 10 or 12 miles W. of Weathersfield, on Connecticut river.—*ib.*

LUE, St, the chief town of the captainſhip of Petagues, in the northern diviſion of Brazil.—*ib.*

LUMBERTON, a poſt-town of N. Carolina, and capital of Robeſon county, ſituated on Drowning creek, 32 miles ſouth of Fayetteville, and 93 S. by W. of Raleigh.—*ib.*

LUNENBURG, a county of Virginia, adjoining Nottaway, Brunſwick, Mecklenburg, and Charlotte counties. It is about 30 miles long, and 20 broad, and contains 8,959 inhabitants, including 4,332 ſlaves. —*ib.*

Lunenburg, a townſhip in Eſſex county, in Vermont; ſituated on Connecticut river, S. W. of Guildhall, and N. E. of Concord. The river takes a S. E. courſe along theſe towns, ſeparating them from Lancaſter, Dalton, and Littleton, in the State of New-Hampſhire. The Upper Bar of the Fifteen mile Falls is oppoſite this town. The Cat Bow, a bend of the Connecticut, is near the middle of the town. The Upper Bar lies in lat. 44° 21′ 30″. The townſhip contains 119 inhabitants.—*ib.*

Lunenburg, a townſhip of New-York, ſituated in Albany county, on the W. ſide of Hudſon's river, oppoſite to the city of Hudſon, and 30 miles ſouth of Albany. It is a thriving village of about 20 or 30 houſes, chiefly new, with a neat Dutch church, ſtanding on the bank of the river. A new road is cutting from this village into the ſettlements on the upper branches of the Delaware and Suſquehannah rivers, which will probably prove highly beneficial to the town. A number of the Meſſrs Livingſtons have purchaſed land in and about this village, to the amount of £10,000, and have laid out a regular town, which will be a rival to Kaats' Kill, 5 miles below. The ſcite of the town is uneven, and not of a very good ſoil.—*ib.*

Lunenburg, a county of Nova-Scotia, on Mahone Bay, on the ſouthern coaſt of the province, facing the Atlantic Ocean. Its chief towns are New-Dublin, Lunenburg, Cheſter, and Blandford. In Mahone Bay, La Have, and Liverpool, ſeveral ſhips trade to England with timber and boards. Cheſter is ſettled by a few New-England families and others: from hence to Windſor is a road the diſtance of 25 miles. —*ib.*

Lunenburg, a townſhip in the above county, ſituated on Merliqueth, or Merliguaſh Bay, well ſettled by a number of induſtrious Germans. The lands are good, and generally well cultivated. It is 35 miles S. W. by S. of Halifax, and 27 N. by E. of Liverpool.—*ib.*

LUPUS, the *Wolf*, a ſouthern conſtellation, joined to the Centaur, containing together 19 ſtars in Ptolomy's catalogue, but 24 in the Britannic catalogue.

LURGAN, a townſhip in Franklin county, Pennſylvania.—*Morse.*

LUTTERELLE, an iſland in Machias Bay, in the Diſtrict of Maine.—*ib.*

LUTTERLOCK, a townſhip in Orleans county, in Vermont, north of Craftſborough, Iraſburgh, Coventry, and Salem, which lie in a N. N. E. direction from this town. Hazen's Road, which extends S. S. E. to the Oxbow on Connecticut river, paſſes through Lutterlock.—*ib.*

LUZERNE, a large county of Pennſylvania, bounded north by Tioga county, in the State of New-York, eaſt and ſouth-eaſt by Northampton, weſt by Lycoming and Northumberland counties. It is about 79 miles in length from north to ſouth, and 75 in breadth from eaſt to weſt, and is divided into 12 townſhips. In this county are 2 churches, 33 ſaw-mills, 24 griſt-mills, 2 fulling-mills, and 1 oil-mill. The number of inhabitants is 4,904, including 11 ſlaves. A great part of the county is barren where remote from rivers. It is well watered by the eaſt branch of Suſquehannah river and its tributaries, which furniſh numerous and excellent mill-ſeats. The ſoil near the river is remarkably fertile, producing good crops of wheat, flax, and hemp. The northern parts abound with pine timber and ſugar-maple. In the townſhips of Wilkſbarre, Kingſton, Exeter, and Plymouth are large beds of coal. Bog-iron is found in ſeveral places, and two forges have been erected. In this county are many remains of ancient fortifications. They are of an elliptical form, and overgrown with large white-oak trees. Chief town, Wilkſbarre.—*ib.*

LYCOMING, a new county in the north-weſtern part of Pennſylvania, bounded north by the State of New-York, and weſt by Alleghany county.—*ib.*

Lycoming, a ſmall creek which runs ſouth, and empties into the weſt branch of Suſquehannah, a few miles weſt of Loyalſock Creek.—*ib.*

Lycoming, a village in Pennſylvania, 40 miles from Northumberland, and 66 from the Painted Poſt in the State of New-York.—*ib.*

LYMAN, a townſhip in Grafton county, New-Hampſhire, ſituated at the foot of a mountain on the eaſt ſide of Connecticut river, between Littleton and Bath, and 7 miles W. by N. of New-Concord. It was incorporated in 1761, and contains 202 inhabitants.—*ib.*

LYME, or *Lime*, a townſhip in Grafton county, New-Hampſhire, ſituated on the eaſt ſide of Connecticut river, 12 miles above Dartmouth College. It was incorporated in 1761, and contains 816 inhabitants. —*ib.*

Lyme, a townſhip in New-London county, Connecticut, the *Nehantick* of the Indians, is ſituated on the eaſt ſide of Connecticut river, at its mouth; bounded ſouth by Long-Iſland Sound, north by Haddam and Colcheſter, and eaſt by New-London. It was ſettled about the year 1664, and was incorporated in May, 1667. It contains three pariſhes, beſides a congregation of Separatiſts, and another of Baptiſts. In 1790, it contained 3,859 inhabitants.—*ib.*

LYNCHBURG, a poſt-town of Virginia, ſituated in Bedford county, on the ſouth ſide of James river, nearly oppoſite to Maddiſon, and one mile diſtant. Here are about 100 houſes, and a large ware-houſe for the inſpection of tobacco. There is alſo a printing-office which iſſues a weekly gazette. In the vicinity of the town are ſeveral valuable merchant mills. It is

12 miles from New-London, 23 from Cabellſburg, 50 from Prince Edward's court-houſe, 150 W. by N. of Richmond, and 408 S. W. of Philadelphia.—*ib.*

LYNDEBOROUGH, a townſhip in Hillſborough county, New-Hampſhire, about 70 miles from Portſmouth. It was incorporated in the year 1764. In 1775 it contained 713; and in 1790, 1,280 inhabitants, who are chiefly farmers.—*ib.*

LYNDON, a townſhip in Caledonia county, in Vermont, lies north of St Johnſbury, and ſouthward of Billymead and Burke. It contains 59 inhabitants.—*ib.*

LYNN, a maritime town in Eſſex county, Maſſachuſetts, ſituated on a bay which ſets up from that of Maſſachuſetts, north-eaſt of Boſton Bay, and about 9 miles north by eaſt of the town of Boſton. The compact part of the town forms a very long ſtreet. The townſhip, named *Saugaus* by the Indians, was incorporated in 1637, and contains 2,291 inhabitants. Here are two pariſhes, beſides a ſociety of Methodiſts, and a large number of Friends. The buſineſs which makes the greateſt figure, and for which the town of Lynn is celebrated, is the manufacture of womens' ſilk and cloth ſhoes. Theſe are diſpoſed of at Boſton, Salem, and other commercial towns, and ſold for home uſe, or ſhipped to the ſouthern States, and to the Weſt-Indies. By a calculation made in 1795, it appeared that there were 200 maſter workmen and 600 apprentices conſtantly employed in this buſineſs, who make annually 300,000 pair of ſhoes. *Lynn Beach* may be reckoned a curioſity. It is a mile in length, and connects the peninſula called *Nahant* with the main land. This is a place of much reſort for parties of pleaſure from Boſton, Charleſtown, Salem, Marblehead, &c. in the ſummer ſeaſon. The beach is uſed as a race-ground, for which it is well calculated, being level, ſmooth, and hard. A mineral ſpring has been diſcovered within the limits of the townſhip, but is not of much note.—*ib.*

LYNNFIELD, a townſhip in Eſſex county, Maſſachuſetts, N. E. of Salem, and 15 miles N. by E. of Boſton. It was incorporated in 1782, and contains 491 inhabitants.—*ib.*

LYNNHAVEN *Bay*, at the ſouth end of Cheſapeak Bay, and into which Lynnhaven river empties its waters, lies between the mouth of James's river and Cape Henry. The mouth of the river is 7 miles weſt of Cape Henry. Here Compte de Graſſe moored the principal part of the French fleet, at the blockade of York-Town in 1781.—*ib.*

LYNX, a conſtellation of the northern hemiſphere, compoſed by Hevelius out of the unformed ſtars. In his catalogue it conſiſts of 19 ſtars, but in the Britannic 44.

LYONS, a town lately laid out in Ontario county, New-York, about 12 miles N. W. of Geneva, at the junction of Mud-Creek and Canandaque Outlet.—*Morse.*

LYSANDER, a townſhip in Onondago county, N. York, incorporated in 1794, and comprehends the military towns of Hannibal and Cicero. The town-meetings are held at the Three Rivers in this town. It is 16 miles S. E. of Lake Ontario. In 1796 there were 10 of its inhabitants entitled to be electors.—*ib.*

LYSTRA, a ſmall town in Nelſon county, Kentucky, ſituated on a weſt water of Rolling Fork, a ſouth branch of Salt river. N. lat. 37° 25′.—*ib.*

M.

MAATEA, one of the Society Iſlands, in the S. Sea, S. lat. 17° 52′, W. long. 148° 1′.—*Morse.*

MACAPA, a town ſituated on the north-weſt bank of Amazon river, W. of Caviana iſland, at the mouth of the river, and a few minutes north of the equinoctial line.—*ib.*

MACAS, the ſouthern diſtrict of Quixos, a government of Peru, in S. America, bounded E. by the government of Maynas; S. by that of Bracamoros and Yaguarſongo; and on the W. the E. Cordillera of the Andes ſeparates it from the juriſdictions of Riobamba and Cuenca. Its capital is the city of Macas, the name commonly given to the whole country. It produces, in great plenty, grain and fruits, copal, and wild wax; but the chief occupation of the country people is the cultivation of tobacco. Sugar-canes thrive alſo here, as alſo cotton; but the dread of the wild Indians prevents the inhabitants from planting more than ſerves for preſent uſe. Here are cinnamon trees, ſaid to be of ſuperior quality to thoſe of Ceylon. There are alſo mines of ultra marine, from which very little is extracted, but a finer colour cannot be imagined. Among the vaſt variety of trees which crown the woods, is the ſtorax, whoſe gum is exquiſitely fragrant, but ſcarce.—*ib.*

MAC-COWAN'S *Ford*, on Catabaw river, is upwards of 500 feet wide, and about 3 feet deep. Lord Cornwallis croſſed here in purſuit of the Americans in 1781, in his way to Hillſborough.—*ib.*

MACHALA, a town of Guayaquil, on the coaſt of Tumbez, in Peru, in a declining ſtate. The juriſdiction of the ſame name produces great quantities of cocoa, reckoned the beſt in all Guayaquil. In its neighbourhood are great numbers of mangles, or mangrove trees, whoſe ſpreading branches and thick trunks cover all the plains; which lying low are frequently overflown. This tree divides itſelf into very knotty and diſtorted branches, and from each knot a multitude of others germinate, forming an impenetrable thicket. The wood of the mangrove tree is ſo heavy, as to ſink in water, and when uſed in ſhips, &c. is found very durable, being ſubject neither to ſplit or rot. The Indians of this juriſdiction pay their annual tribute in the wood of the mangrove tree.—*ib.*

MACHANGARA, a river formed by the junction of ſeveral ſtreams, iſſuing from the ſouth and weſt ſides of the Panecillo or Sugar-Loaf mountain, on the ſouth-weſt ſide of Quito, in Peru. It waſhes the ſouth parts of the city, and has a ſtone bridge over it. —*ib.*

MACHIAS, a port of entry, poſt-town and ſeat of juſtice, in Waſhington county, Diſtrict of Maine, ſituated on a bay of its own name, 20 miles ſouth-weſt of Paſſamaquoddy, 95 E. by N. of Penobſcot, and 236 north-eaſt of Portland, in 47° 37′ N. lat. It is a thriving place, and carries on a conſiderable trade to Boſton and the Weſt-Indies in fiſh, lumber, &c. It is contemplated to eſtabliſh a regular poſt between this town and Halifax, in Nova Scotia. The name of the town is altered from the Indian name Mechiſſes, given to the river in the oldeſt maps. It is 400 miles north-eaſt of Boſton, and about 300 by water. Early attempts were made to ſettle here, but the firſt permanent ſettlement was made in 1763, by 15 perſons of both ſexes from Scarborough, in Cumberland county, and in 1784 the town was incorporated. The chief ſettlements are at the eaſt and weſt Falls, and at Middle river. *Machias river*, after running a north courſe, 6 miles diſtance from Croſs iſland, (which forms its entrance) ſeparates at a place called *the Rim;* one branch taking a north-eaſt direction, runs 2½ miles, with a width of 30 rods to the head of the tide, where are two double ſaw-mills, and one griſt-mill. The main branch runs a north-weſt courſe, nearly 3 miles, and is 70 rods wide, to the head of the tide, where are two double and ſingle ſaw-mills, and two griſt-mills. The chief ſettlement is at Weſt Falls, the county courts being held and the gaol erected there. The main channel of the river takes its courſe to theſe falls, which, though crooked and narrow, admits veſſels of burden to load at the wharves within 50 rods of the mills. This advantage no other part of the town can enjoy. The entrance of Machias river is in N. lat. 44° 35′, W. long. 66° 56′. The town is divided into 4 diſtricts for the ſupport of ſchools; and into 2 for the convenience of public worſhip. In 1792 Waſhington academy was eſtabliſhed here. The general court incorporated a number of gentlemen as truſtees, and gave for its ſupport a townſhip of land. In 1790 the town contained 818 inhabitants. Since that time its population has rapidly increaſed. The exports of Machias conſiſt principally of lumber, viz. boards, ſhingles, clapboards, laths, and various kinds of hewed timber. The cod-fiſhery might be carried on to advantage though it has been greatly neglected. In 1793, between 70 and 80 tons were employed in the fiſhery; and not above 500 quintals were exported. The mill-ſaws, of which there are 17, cut on an average three million feet of boards annually. A great proportion of timber is uſually ſhipped in Britiſh veſſels. The total amount of exports annually exceeds 15,000 dollars. From Machias Bay to the mouth of St Croix, there are a great many fine iſlands; but the navigation is generally without theſe in the open ſea. In the year 1704, when Col. Church made an attack on the French plantation on the river Schoodick, he found one Lutterelle, a French nobleman, on one of theſe iſlands, and removed him. The iſland ſtill retains his name.—*ib.*

MACHINERY.

THE denomination *Machine* is now vulgarly given to a great variety of ſubjects, which have very little analogy by which they can be claſſed with propriety under any one name. We ſay a travelling machine, a bathing machine, a copying machine, a threſhing machine, an electrical machine, &c. &c. The only circumſtance in which all theſe agree ſeem to be, that their conſtruction is more complex and artificial than the utenſils, tools, or inſtruments which offer themſelves to the firſt thoughts of uncultivated people. They are more artificial than the common cart, the bathing tub, or the flail. In the language of ancient Athens and Rome, the term was applied to every tool by which hard labour of any kind was performed; but in the language of modern Europe, it ſeems reſtricted either to ſuch tools or inſtruments as are employed for executing ſome philoſophical purpoſe, or of which the conſtruction employs the ſimple mechanical powers in a conſpicuous manner, in which their operation and energy engage the attention. An electrical machine, a centrifugal machine, are of the firſt claſs; a threſhing machine, a fire machine, are of the other claſs. It is nearly ſynonymous, in our language, with ENGINE; a term altogether modern, and in ſome meaſure honourable, being beſtowed only, or chiefly, on contrivances for executing work in which ingenuity and mechanical ſkill are manifeſt. Perhaps, indeed, the term *engine* is limited, by careful writers, to machines of conſiderable magnitude, or at leaſt of conſiderable art and contrivance. We ſay, with propriety, ſteam engine, fire engine, plating-engine, boring-engine; and a dividing machine, a copying machine, &c. Either of theſe terms, *machine* or *engine*, are applied with impropriety to contrivances in which ſome piece of work is not executed on materials which are then ſaid to be manufactured. A travelling or bathing machine is ſurely a vulgariſm. A machine or engine is therefore a TOOL; but of complicated conſtruction, peculiarly fitted for expediting labour, or for performing it according to certain invariable principles: And we ſhould add, that the dependence of its efficacy on mechanical principles muſt be apparent, and even conſpicuous. The contrivance and erection of ſuch works conſtitute the profeſſion of the engineer; a profeſſion which ought by no means to be confounded with that of the mechanic, the artiſan, or manufacturer. It is one of the *artes liberales;* as deſerving of the title as medicine, ſurgery, architecture, painting, or ſculpture. Nay, whether we conſider the importance of it to this flouriſhing nation, or the ſcience that is neceſſary for giving eminence to the profeſſor, it is very doubtful whether it ſhould not take place of the three laſt named, and go *pari paſſu* with ſurgery and medicine. The inconſiderate reader, who peruſes *Cicero de Oratore* with ſatisfaction, is apt to ſmile at Vitruvius, who requires in his architect nearly the ſame accompliſhments which Cicero requires in his orator. He has not recollected, or perhaps did not know, that the profeſſion of an architect in the

Auguſtan age was the moſt reſpectable of all thoſe which were not eſſentially connected with the management of ſtate affairs. It appears that the architects were all Greeks, or the pupils of Greeks, altogether different from the members of the *Collegium Murariorum*, the corporation of builders and maſons. The architecture of temples, ſtadiums, circuſes, amphitheatres, ſeems to have been monopoliſed, by ſtate authority, by a ſociety which had long ſubſiſted in Aſia, connected by certain myſterious bonds, both civil and religious. We find it in Syria; and we learn that it was brought thither from Perſia in very ancient times. From thence it ſpread into Ionia, where it became a very eminent and powerful aſſociation, under the particular protection of Bacchus, to whom the members had erected a magnificent temple at Teos, with a vaſt eſtabliſhment of prieſts and prieſteſſes, conſiſting of perſons of the firſt rank in the ſtate. They were the ſole builders of temples and ſtadiums throughout all Greece and the Leſſer Aſia; and the contractors for the machinery that was employed in the theatres, and in the great temples, for the celebration of the high myſteries of paganiſm. By the imperfect accounts which remain of the Eleuſinian and other myſteries, it appears, that this machinery muſt have been immenſe and wonderful, and muſt have required a great deal of mechanical ſkill. This indeed appears, in the moſt convincing manner, to any perſon who reflects on the magnificent ſtructures which they erected, which excite to this day the wonder of the world, not only on account of their magnificence and incomparable elegance, but alſo on account of the mechanical knowledge that ſeems indiſpenſably neceſſary for their erection. This will ever remain a myſtery. There are no traces of ſuch knowledge to be found in the writings of antiquity. Even Vitruvius, writing expreſsly on the ſubject, has given us nothing but what is in the loweſt degree of elementary knowledge.

This aſſociation of the Dyoniſiacs undoubtedly kept their mechanical ſcience a profound ſecret from the uninitiated, the profane. They were the engineers of antiquity, and Vitruvius was perhaps not one of the initiated. He ſpeaks of Myro and other Greek architects in terms of reſpect which border on veneration. Perhaps the modern aſſociation of free maſons is a remain of this ancient fraternity, continued to our times by the company of builders, who erected the cathedrals and great conventual churches. No one who conſiders their works with ſcientific attention, can doubt of their being deeply verſed in the principles of mechanics, and even its more refined branches. They appear to have carried the art of vault-roofing almoſt to its acmé of perfection; far outſtripping their Grecian inſtructors in their knowledge of this moſt delicate branch of their art.

It were greatly to be wiſhed that ſome ſuch inſtitution did yet exiſt, where men might be induced by the moſt powerful motives to accompliſh themſelves in the knowledge neceſſary for attaining eminence in their profeſſion.

We have been informed (and we thought our authority good), that the King has ſignified his intention of patroniſing an inſtitution of this kind. We heard, that it was propoſed to inſtitute degrees ſimilar to our univerſity degrees, and proceeding on ſimilar conditions of a regular education or ſtanding, which would enſure the *opportunities* of information, and alſo on an examination of the proficiency of the candidate. This examination, being conducted by perſons eminent in the profeſſion, perhaps ſtill exerciſing it, would probably be ſerious, becauſe the ſucceſsful candidate would immediately become a rival practitioner. Such an inſtitution would undoubtedly prevent many groſs impoſitions by unlettered mill-wrights and pump-makers, who now ſeldom appear under any name but that of engineer, although they are frequently ignorant even of the elements of mechanical ſcience, and are totally unacquainted with the higher mathematics; without which it is abſolutely impoſſible for them to contrive a machine well ſuited to the intended purpoſe, or to ſay with any tolerable preciſion what will be the performance of the engine they have erected. Yet theſe are queſtions ſuſceptible of accurate ſolution, becauſe they depend on the unalterable laws of matter and motion.

All who have a juſt view of the unſpeakable advantages which this highly favoured land poſſeſſes in the ſuperiority and activity of its manufactures, and who know how much of this ſuperiority ſhould be aſcribed to the great improvements which have been made in practical mechanics within theſe laſt thirty years, will join us in wiſhing ſucceſs to ſome ſuch inſtitution as that now mentioned.

We were naturally led to theſe reflections when we turned our thoughts to machinery in general, and obſerved what is done in this country by the native energy of its inhabitants, unaſſiſted by ſuch ſcientific inſtructions as they might have expected from the pupils of a Newton, their countryman, under the patronage of the beſt of Sovereigns, eminently knowing in theſe things, and ever ready to encourage thoſe ſciences and arts which have ſo highly contributed to the national proſperity. What might not be reaſonably expected from Britiſh activity, if thoſe among ourſelves who have knowledge and leiſure had been at the ſame pains with the members of the foreign academies to cultivate the Newtonian philoſophy, and particularly the more refined branches of mechanics, and to deduce from their ſpeculations maxims of conſtruction fitted to our ſituation as a great manufacturing nation? But ſuch knowledge is not attainable by thoſe who are acquainted only with the imperfect elements contained in the publications read by the bulk of our practitioners. Much to this purpoſe has been done on the continent by the moſt eminent mathematicians; but from want of individual energy, or perhaps of general ſecurity and protection, the patriotic labours of thoſe gentlemen have not done the ſervice to their country which might have been reaſonably expected. Indeed, their diſſertations have generally been ſo compoſed, that only the learned could ſee their value. They ſeem addreſſed only, or chiefly, to ſuch; but it is to thoſe authors that our countrymen generally have recourſe for information concerning every thing in their profeſſion that riſes above mere elementary knowledge. The books in our language which profeſs to be ſyſtems of mechanics rarely go beyond this: they contain only the principles of equilibrium. Theſe are abſolutely neceſſary for the knowledge of machines; but they are very far indeed from giving what may be called a practical knowledge of *working machinery*. This is never in a ſtate of equilibrium. The machine muſt move in order to work.

There muſt be a ſuperiority of impelling power, beyond what is merely ſufficient for balancing the reſiſtance or contrary action of the work to be performed. The reader may turn to the article STATICS in the *Encyclopædia*, and he will there ſee ſome farther obſervations on this head. And in the article MECHANICS he will find a pretty ample detail of all the uſual doctrines, and a deſcription of a conſiderable variety of machines or engines, accompanied by ſuch obſervations as are neceſſary for tracing the propagation or tranſmiſſion of preſſure from that part of the machine to which the natural power is applied to the working part of the machine. Along with theſe two articles, it will be proper to read with peculiar attention the article ROTATION.

By far the greateſt number of our moſt ſerviceable engines conſiſt chiefly of parts which have a motion of rotation round fixed axes, and derive all their energy from levers virtually contained in them. And theſe acting parts are alſo material, requiring force to move them, over and above what is neceſſary for producing the acting force at the working part of the machine. The modifications which this circumſtance frequently makes of the whole motions of the machine, are indicated in the article ROTATION in an elementary way; and the propoſitions there inveſtigated will be found almoſt continually involved in the complete theory of the operation of a machine. Laſtly, it will be proper to conſider attentively the propoſitions contained in the article *STRENGTH of Materials*, that we may combine them with thoſe which relate wholly to the working of the machine; becauſe it is from this combination only that we diſcover the ſtrains which are excited at the various points of ſupport, and of communication, and in every member of the machine. We ſuppoſe all theſe things already underſtood.

1 The chief queſtion in mechanics.

Our object at preſent is to point out the principles which enable us to aſcertain what will be the preciſe motion of a machine of given conſtruction, when actuated by a natural power of known intenſity, applied to a given point of the machine, while it is employed to overcome a known reſiſtance acting at another point. To abbreviate language, we ſhall call that the IMPELLED POINT of the machine to which the preſſure of the moving power is immediately applied; and we may call that the WORKING POINT, where the reſiſtance ariſing from the work to be performed immediately acts.

To conſider this important ſubject, even in its chief varieties, requires much more room than can be allowed in an undertaking like ours, and therefore we muſt content ourſelves with a very limited view; but at the ſame time, ſuch a view as ſhall give ſufficient indication of the principles which ſhould direct the practical reader in every important caſe. We ſhall conſider thoſe machines which perform their motions round fixed axes; theſe being by far the moſt numerous and important, becauſe they involve in their conſtruction and operations all the leading principles.

2 The proper meaſure of mechanical power exerted.

That we may proceed ſecurely, it is neceſſary to have a preciſe and adequate notion of moving force, as applied to machinery, and of its meaſures. We think this peculiarly neceſſary. Different notions have been entertained on this ſubject by Mr Leibnitz, Des Cartes, and other eminent mechanicians of the laſt century; and their ſucceſſors have not yet come to an agreement. Nay, ſome of the moſt eminent practitioners of the preſent times (for we muſt include Mr Smeaton in the number) have given meaſures of mechanical power in machinery which we think inaccurate, and tending to erroneous concluſions and maxims.

We take for the meaſure (as it is the effect) of exerted mechanical power the quantity of motion which it produces by its uniform exertion during ſome given time. We ſay *uniform exertion*, not becauſe this uniformity is neceſſary, but only becauſe, if any variation of the exertion has taken place, it muſt be known, in order to judge of the power. This would needleſsly complicate the calculations; but in whatever way the exertion may have varied, the whole accumulated exertion is ſtill accurately meaſured by the quantity of motion exiſting at the end of the exertion. The reader muſt perceive that this is the ſame thing that is expreſſed in the article DYNAMICS of this *Supplement*, n° 90. by the area of the figure whoſe abſciſſa or axis repreſents the time of exertion; and the ordinates are as the preſſures in the different inſtants of that time, the whole being multiplied by the number of particles (that is, by the quantity of matter), becauſe that figure repreſents the quantity of motion generated in one particle of matter only. All this is abundantly clear to perſons converſant in theſe diſquiſitions; but we wiſh to carry along with us the diſtinct conceptions of that uſeful claſs of readers whoſe profeſſion engages them in the conſtruction and employment of machines, and to whom ſuch diſcuſſions are not ſo familiar. We muſt endeavour therefore to juſtify our choice of this meaſure by appealing to familiar facts.

If a man, by preſſing uniformly on a maſs of matter for five ſeconds, generates in it the velocity of eight feet per ſecond, we obtain an exact notion of the proportion of this exertion to the mechanical exertion of gravity, when we ſay that the man's exerted force has been preciſely one-twentieth part of the action of gravity on it; for we know that the weight of that body (or, more properly, its heavineſs) would, in five ſeconds, have given it the velocity of 160 feet per ſecond, by acting on it during its fall. But let us attend more cloſely to what we mean by ſaying that the exerted force is one-twentieth of the exertion of gravity. The only notion we have of the exertion of gravity is what we call the weight of the body—the preſſure which we feel it make on our hand. To ſay that this is 20 pounds weight, does not explain it; becauſe this is only the action of gravity on another piece of matter. Both preſſures are the ſame. But if the body weighs 20 pounds, it will draw out the rod of a ſteelyard to the mark 20. The rod is ſo divided, that the 20th part of this preſſure will draw it out to 1. Now the fact is, that if the man preſſes on the maſs of 20 pounds weight with a ſpring ſteelyard during five ſeconds, and if during that time the rod of the ſteelyard was always at the mark 1, the body will have acquired the velocity of eight feet per ſecond. This is an acknowledged fact. Therefore we were right in ſaying, that the man's exertion is one-twentieth of the exertion of gravity. And ſince we believe the weight of bodies to be proportional to their quantity of matter, all matter being equally heavy, we may ſay, that the man's exertion was equal to the action of gravity on a quantity of matter whoſe weight is one pound. We expreſs it much more familiarly,

liarly, by ſaying, that the man exerted on it the preſſure of one pound of matter, or the force of one pound.

In this manner, the motion communicated to a maſs of matter, by acting on it during ſome time, informs us with accuracy of the real mechanical force or preſſure which has been exerted. This is judged to be double when twice the velocity has been generated in the ſame maſs, or where the ſame velocity has been generated in twice the maſs; becauſe we know, that a double preſſure would have done either the one or the other.

But farther: We know that this preſſure is the exertion; we have no other notion of our own force; and our notion of gravity, of elaſticity, or any other natural force, is the ſame. We alſo know that the continuance of this exertion fatigues and exhauſts our ſtrength as completely as the moſt violent motion. A dead pull, as it is called, of a horſe, at a poſt fixed in the ground, is a uſual trial of his ſtrength. No man can hold out his arm horizontally for much more than a quarter of an hour; and the exertion of the laſt minutes gives the moſt diſtreſſing fatigue, and diſables the ſhoulder from action for a conſiderable time after. This is therefore an expenditure of mechanical power, in the ſtrict primitive ſenſe of the word. Of this expenditure we have an exact and adequate effect and meaſure in the quantity of motion produced; that is, in the product of the quantity of matter by the velocity generated in it by this exertion. And it muſt be particularly noticed, that this meaſure is applicable even to caſes where no motion is produced by the exertion; that is, if we know that the exertion which is juſt unable to ſtart a block of ſtone lying on a ſmooth ſtone pavement, but would ſtart it, if increaſed by the ſmalleſt addition; and if we know that this would generate in a ſecond 32 feet of velocity in 100 pounds of matter—we are certain that it was a preſſure equal to the weight of this 100 pounds. It is a good meaſure, though not immediate, and may be uſed without danger of miſtake when we have no other.

3 Mr. Smeaton's meaſure

The celebrated engineer Mr Smeaton, in his excellent diſſertation on the power of water and wind to drive machinery, and alſo in two other diſſertations, all publiſhed in the Philoſophical Tranſactions, and afterwards in a little volume, has employed another meaſure, both of the expenditure of mechanical power, and of the mechanical effect produced. He ſays, that the weight of a body, multiplied by the height thro' which it deſcends, while driving a machine, is the only proper meaſure of the power expended; and that the weight, multiplied by the height through which it is uniformly raiſed, is the only proper meaſure of the effect produced. And he produces a large train of accurate experiments to prove that a certain weight, deſcending through a certain ſpace, always produces the ſame effect, whether it has deſcended ſwiftly or ſlowly, employing little or much time.

Had this eminent engineer propoſed this as a popular meaſure, of eaſy comprehenſion and remembrance, and as well accommodated to the uſes of thoſe engaged in the conſtruction of machines, when reſtricted to a certain claſs of caſes, it might have anſwered very good purpoſes; but the author is at pains to recommend it to the philoſophers as a neceſſary correction of their theories, which he ſays tend to miſlead the artiſts. His own reaſonings terminate in the ſame concluſion with Mr Leibnitz's, namely, that the power of producing a mechanical effect, and the effect produced, are proportional to the ſquare of the velocity. The deference juſtly due to Mr Smeaton's authority, and the influence of his name among thoſe who are likely to make the moſt uſe of his inſtructions, render it neceſſary for us to examine this matter with ſome attention.

Mr Smeaton was led to the adoption of this meaſure by his profeſſional habits. Raiſing a weight to a height is, in one ſhape or another, the general taſk of the machines he was employed to erect; and we may add, the opportunities of expending the mechanical powers of nature which are in our command, are generally in this proportion. A certain daily ſupply of water, coming from a certain height, is our beſt opportunity, and may very properly be ſaid to be expended.

4 Examined.

This being the general caſe, the meaſure was obvious, and natural, and good. The power and effect were of the ſame kind, and *muſt* be meaſures of each other; at leaſt, in thoſe circumſtances in which they were ſet in oppoſition. Yet even here Mr Smeaton was obliged to make a reſtriction of his meaſures: "The height thro' which a body *ſlowly and equably* deſcended, or to which it was raiſed." And why was this limitation neceſſary? "Becauſe in rapid or accelerated motions, the inertia of bodies occaſioned ſome variation*." But this is too vague language for philoſophical diſquiſition. Beſides, what is meant by this variation? What is the ſtandard from which the unreſtricted meaſure varies? This ſtandard, whatever it is, is the true meaſure, and it was needleſs to adopt any other. Now, the ſtandard from which Mr Smeaton eſtimates the deviation, is the very meaſure which we wiſh to employ, namely, the quantity of motion produced. Strictly ſpeaking, even this is not the immediate meaſure. The immediate meaſure is that faculty which we call preſſure. This is the intermedium perceivable in all productions of motion; and it is alſo the intermedium of mechanical effect, even when motion is not produced; as when the weight of a body bends a ſpring, or the elaſticity of a body ſupports another preſſure. How it operates in all or any of theſe caſes, we know not; but we know that all theſe meaſures of preſſure agree with each other. A double quantity of motion will bend a ſpring doubly ſtrong, will raiſe a double weight, will withſtand any double preſſure, &c. &c. In ſhort, preſſure is the immediate agent in every mechanical phenomenon. It penetrates bodies, overcoming their tenacity; it overcomes friction; it balances preſſure; it produces motion. Mr Smeaton's meaſure is only nearly true, in any caſe, and in all caſes it is far from being exact in the firſt inſtants of the motion, during its acceleration or retardation.

We have already noticed the complete expenditure of animal power by continued preſſure, even when motion is not produced: the only difficulty is to connect this in a meaſurable way with the power which the ſame exertion has of generating motion in a body.

When a man ſupports a weight for a ſingle inſtant, he certainly balances the preſſure or action of gravity on that body; and he continues this action as long as he continues to ſupport it: and we know that if this body were at the end of a horizontal arm turning round a vertical axis, the ſame effort which the man exerted in merely

* Page 7.

merely carrying the weight, if now exerted on the body, by puſhing it horizontally round the axis, will generate in it the ſame velocity which gravity would generate by its falling freely. On this authority therefore we ſay, that the whole accumulated action of a man, when he has juſt carried a body whoſe weight is 30 pounds for one minute, is equal to the whole exertion of gravity on it during that minute; and if employed, not to counteract gravity, but to generate motion, would generate, during that minute, the ſame motion that gravity would, that is, 60 × 32 feet velocity per ſecond, in a maſs of 30 pounds. There would be 30 pounds of matter moving with the velocity of 1920 feet per ſecond. We would expreſs this production or effect by 30×1920, or by 57600, as the meaſure of the man's exertion during the minute.

But, according to Mr Smeaton, there is no expenditure of power, nor any production of mechanical effect, in thus carrying 30 pounds for a minute; there is no product of a weight by a height through which it is equably raiſed; yet ſuch exertion will completely exhauſt a man's ſtrength if the body be heavy enough. Here then is a caſe to which Mr Smeaton's meaſure does not readily apply; and this caſe is important, including all the actions of animals at a dead pull.

But let us conſider more narrowly what a man really does when he performs what Mr Smeaton allows to be the production of a meaſurable mechanical effect. Suppoſe this weight of 30 pounds hanging by a cord which paſſes over a pulley, and that a man, taking this cord over his ſhoulder, turns his back to the pulley, and walks away from it. We know, that a man of ordinary force will walk along, raiſing this weight, at the rate of about 60 yards in a minute, or a yard every ſecond, and that he can continue to do this for eight or ten hours from day to day; and that this is all that he can do without fatigue. Here are 30 pounds raiſed uniformly 180 feet in a minute; and Mr Smeaton would expreſs this by 30 × 180, or 5400, and would call this the meaſure of the mechanical effect, and alſo of the expenditure of power. This is very different from our meaſure 57600.

5
And found to be inaccurate.

But this is not an accurate and complete account of the man's *action* on the weight, and of the whole effect produced. To be convinced of this, ſuppoſe that a man A has been thus employed, while another B, walking along ſide of him at the ſame rate, ſuddenly takes the rope out of his hand, frees him of the taſk, and *continues* to raiſe the weight without the ſmalleſt change on its velocity of aſcent. What is the action of B, and whether is it the ſame with that of A or not? It is acknowledged by all, that the exertion of B againſt the load is preciſely equal to 30 pounds. If he holds the rope by a ſpring ſteelyard, it will ſtand conſtantly at the mark 30. B exerts the ſame action on the load as when he ſimply ſupports it from falling back into the pit. It was moving with the velocity of three feet per ſecond when he took hold of the rope, and it would continue to move with that velocity if any thing could annihilate or counteract its gravity. If therefore there was no action when a perſon merely carried it, there is none at preſent when it is riſing 180 feet in a minute. The man does indeed work more than on that occaſion, but not againſt the load: his additional work is walking, the motion of his own body, as a thing previouſly neceſſary that he may continue to ſupport the load, that he may continue his mechanical effort as it follows him. It appears to yield to him: but it is not to *his* efforts that it yields; its weight completely balances thoſe efforts, and is balanced by them. It was to a *greater* effort of the man A that it yielded. It was then lying on the ground. He pulled at the cord, gradually perhaps increaſing his pull till it was juſt equal to its weight. When this obtains, the load no longer preſſes on the ground, but is completely carried by the rope. But it does not move by this effort of 30 pounds; but let him exert a force of 31 pounds, and continue this for three ſeconds. He will put it in motion; will accelerate that motion; and at the end of three ſeconds the load is riſing with the velocity of three feet per ſecond. The man feels that this is as much ſpeed as he can continue in his walk; he therefore ſlackens his pull, reducing his action to 30 pounds, and with this action he walks on. All this would be diſtinctly perceived by means of a ſteelyard. The rod would be pulled out beyond 30, till the load acquired the uniform velocity intended, and after this it would be obſerved to ſhrink back to 30.

More is done therefore than appears by Mr Smeaton's meaſure. Indeed, all that appears in it is the exertion neceſſary for *continuing* a motion already produced, but which would be immediately extinguiſhed by a contrary power, which muſt therefore be counteracted. This meaſure will not apply to numberleſs caſes of the employment of machines, where there is no ſuch oppoſing power, and where, notwithſtanding, mechanical power muſt be expended, even according to Mr Smeaton's meaſurement. Such are corn mills, boring mills, and many others.

How then comes it that Mr Smeaton's valuable experiments concur ſo exactly in ſhewing that the ſame quantity of water deſcending from the ſame height, always produces the ſame effect (as he meaſured it), whatever be the velocity? In the firſt place, all his experiments are caſes where the power expended and the work performed are of the ſame kind: A heavy body deſcends, and by its preponderancy raiſes another heavy body. But even this would not enſure the preciſe agreement obſerved in his experiments, if Mr Smeaton were not careful to exclude from his calculations all that motion where there is any acceleration, and all the expenditure of water during the acceleration, and to admit only thoſe motions that are ſenſibly uniform. In moderate velocities, the additional preſſure required for the firſt acceleration is but an inſignificant part of the whole; and to take theſe accelerated motions into the account, would have embarraſſed the calculations, and perhaps confuſed many of the readers. We ſee, in the inſtance now given, that the addition of one pound continued for three ſeconds only, was all that was neceſſary.

Mr Smeaton's meaſurement is therefore abundantly exact for practice; and being accommodated to the circumſtances moſt likely to engage the attention, is very proper for the inſtruction of the numerous practitioners in all manufacturing countries who are employed for ordinary erections: but it is improperly propoſed as an article eſſential to a juſt theory of mechanics, and therefore it was proper to notice it in this place. Beſides, there frequently occur moſt important caſes, in which the motion of a machine is, of neceſſity, deſultory, alternately accelerated, and retarded. We ſhould not derive all the advantages in our power from the firſt mover, if we did not attend particularly, and chiefly, to the *accelerating* forces. And in every caſe, the improvement, or the proper employment of the machine, is not attained, if we are not able to diſcriminate between the two parts of the mechanical exertion; one of them, by which the motion is produced and accelerated to a certain degree; and the other, by which that motion is continued. We muſt be able to appreciate what part of the effect belongs to each.—But it is now time to proceed to the important queſtion,

What will be the preciſe motion of a machine of given conſtruction, actuated by a power of known intenſity and manner of acting, and oppoſed by a known reſiſtance?

6
Things to be conſidered in a machine at work.

In the ſolution of this queſtion, much depends on the nature of both power and reſiſtance. In the ſtatical conſideration of machines, no attention is paid to any differences. The intenſity of the preſſures is all that it is neceſſary to regard, in order to ſtate the proportion of preſſure which will be exerted in the various parts of the machine. The preſſures at the impelled and working points, combined with the proportions of the machine, neceſſarily determine all the reſt. Preſſure being the ſole cauſe of all mechanical action among bodies, any preſſure may be ſubſtituted for another that is equal to it; and the preſſure which is moſt familiar, or of eaſieſt conſideration, may be uſed as the repreſentative of all others. This has occaſioned the mechanical writers to make uſe of the preſſure of gravity as the ſtandard of compariſon, and to repreſent all powers and reſiſtances by weights. However proper this may be in their hands, it has hurt the progreſs of the ſcience. It has rendered the uſual elementary treatiſes of mechanics very imperfect, by limiting the experiments and illuſtrations to ſuch as can be ſo repreſented with facility. This has limited them to the ſtate of equilibrium (in which condition a working machine is never found), becauſe illuſtrations by experiment out of this ſtate are neither obvious nor eaſy. It has alſo prevented the ſtudents of mechanics from accompliſhing themſelves with the mathematical knowledge required for a ſucceſsful proſecution of the ſtudy. The moſt elementary geometry is ſufficient for a thorough underſtanding of equilibrium, or the doctrines of ſtatics; but true mechanics, the knowledge of machines as inſtruments by which work is performed, requires more refined mathematics, and is inacceſſible without it.

Had not Newton or others improved mathematics by the invention of the infiniteſimal analyſis and calculus, we muſt have reſted contented with the diſcoveries (really great) of Galileo and Huyghens. But Newton, *ſuâ matheſi facem præferente*, opened a boundleſs field of inveſtigation, and has not only given a magnificent and brilliant ſpecimen of the diſcoveries to be made in it, but has alſo traced out the particular paths in which we are to find the ſolution of all queſtions of practical mechanics. This he has done by ſhewing another ſpecies of equilibrium, indicated, not by the ceſſation of all motion, but by the uniformity of motion; by the ceſſation of all acceleration or retardation. As the extinction of motion by the action of oppoſite forces is aſſumed by us as the indication of the perfect equality of thoſe forces; ſo the extinction of acceleration ſhould be received as the indication of ſomething equal and oppoſite to the force which was known to have cauſed the acceleration; and therefore as the indication of an equilibrium between oppoſite forces, or elſe of the ceſſation of all force.

7
Mechanical equilibrium.

This new view of things was the ſource of all our diſtinct notions of mechanical forces, and gave us our only unexceptionable marks and meaſures of them. The 39th propoſition of the firſt book of Newton's Principles of Natural Philoſophy, and its corollaries, contain almoſt the whole doctrine of active mechanical nature, and are peculiarly applicable to our preſent purpoſe, becauſe they enable us to comprehend in this *mechanical equilibrium* (ſo different from the *ſtatical*) every circumſtance in which thoſe preſſures which are exerted by natural powers differ from each other, and vary in their action on the impelled and working points of a machine. Indeed, when we recollect that the operations of our machines are the ſame on board a ſhip as on ſhore, and that all our machines are moving with the ground on which they ſtand, we muſt acknowledge, that even ordinary ſtatics is only an imperfect view of an equilibrium among things which are in motion; and this ſhould have taught us that, even in thoſe caſes where nothing like equilibrium appears, an equilibrium may ſtill be uſefully traced.

8
Diſtinctions muſt be made in the nature of the powers applied to working machines.

In the ſtatical conſideration of machines, the *quantity* of preſſure is all that we need attend to. But in the mechanical diſcuſſion of their *operations*, we muſt attend to their diſtinctions in kind: and it will by no means be ſufficient to repreſent them all by weights; for their diſtinction in kind is accompanied by great differences in their manner of acting on the machine. Some natural powers, in order to continue their action on the impelled point of the machine, muſt at the ſame time put into motion a quantity of matter external to the machine, in which theſe powers reſide; and this muſt be made to follow the impelled point in its motion, and not only follow, but continue to preſs it forward; or, this matter, thus continually put into motion, muſt be ſucceſſively applied to different points of the machine, which become impelled points in their turn. This is the caſe with a weight, with the action of a ſpring, the action of animals, the action of a ſtream of water or wind, and many other powers. A part of the natural mechanical powers muſt therefore be employed in producing this external motion. This is ſometimes a very conſiderable part of the whole natural power. In ſome caſes it is the whole of it. This obtains in the action of a deſcending weight, lying on the end of a lever and preſſing it down, or hanging by a chord attached to the machine.

There is alſo an important diſtinction in the manner in which this external motion is kept up. In a weight employed as the moving power, the actuating preſſure ſeems to reſide in the matter itſelf; and all that is neceſſary for continuing this preſſure is merely to continue the connection of it with the machine. But in the action of animals it may be very different: A man puſhing at a capſtan bar, muſt firſt of all walk as faſt as the bar moves round, and this requires the expenditure of his muſcular force. But this alone will not render his action an effective power: He muſt alſo *preſs forward* the capſtan bar with as much force as he has remaining over and above what he expends in walking at that rate. The proportion of theſe two expenditures may be very different in different circumſtances; and in the judicious ſelection of ſuch circumſtances as make the firſt of theſe as inconſiderable as poſſible, lies much of the ſkill and ſagacity of the engineer. In the common operation of thraſhing corn, much more than half of the man's power is expended in giving the neceſſary motion to his own body, and only the remainder is employed in urging forward the ſwiple with a momentum ſufficient for ſhaking off the ripe grains from the ſtalk. We had ſufficient proof of this, by taking off the ſwiple of the flail, and putting the ſame weight of lead on the end of the ſtaff, and then cauſing the hind to perform the uſual motions of thraſhing with all the rapidity that he could continue during the ordinary hours of work. We never could find a man who could make three motions in the ſame time that he could make two in the uſual manner, ſo as to continue this for half an hour. Hence we muſt conclude, that half (ſome will ſay two-thirds) of a thraſher's power is expended in merely moving his own body. Such modes of animal action will therefore be avoided by a judicious engineer; but to be avoided, their inconvenience muſt be underſtood. More of this will occur hereafter.—In other caſes, we are almoſt (never wholly) free from this unprofitable expenditure of power. Thus, in the ſteam engine, the operation requires that the external air follow the piſton down the cylinder, in order to continue its preſſure. But the force neceſſary for ſending in this rare fluid into the cylinder with the neceſſary velocity, is ſuch an inſignificant part of the whole force which is at our command, that it would be ridiculous affectation in any engineer to take it into account; and this is one great ground of preference to this natural power. The ſame thing may be ſaid of the action of a ſtrong and light ſpring, which is therefore another very eligible firſt mover for machinery. The ancient artilleriſts had diſcovered this, and employed it in their warlike engines.

We muſt alſo attend to the nature of the reſiſtance which the work to be performed oppoſes to the motion of our machine. Sometimes the work oppoſes, not a ſimple obſtruction, but a real reſiſtance or reaction, which, if applied alone to the machine, would cauſe it to move the contrary way. This always obtains in caſes where a heavy body is to be raiſed, where a ſpring is to be compreſſed, and in ſome other caſes. Very often, however, there is no ſuch contrary action. A flour mill, a ſaw mill, a boring mill, and many ſuch engines, exhibit no reaction of this kind. But although ſuch machines, when at reſt or not impelled by the firſt mover, ſuſtain no preſſure in the oppoſite direction, yet they will not acquire any motion whatever, unleſs they be impelled by a power of a certain determinate intenſity. Thus in a ſaw mill, a certain force muſt be impreſſed on the teeth of the ſaw, that the coheſion of the fibres of the timber may be overcome. This requires that a certain force, determined by the proportions of the machine, be impreſſed on the impelled point. If this, and no more, be applied there, a force will be excited at the teeth of the ſaw, which will *balance* the coheſion of the wood, but will not *overcome* it. The machine will continue at reſt, and no work will be performed. Any addition of force at the impelled point, will occaſion an addition to the force excited in the teeth of the ſaw. The coheſion will be overcome, the machine will move, and work will be performed. It is only this *addition* to the impelling power that gives motion to the machine; the reſt being expended merely in balancing the coheſion of the woody fibres. While therefore the machine is in motion, performing work, we muſt conſider it as actuated by a force impreſſed on the impelled point by the natural power, and by another acting at the working point, furniſhed by or derived from the reſiſtance of the work.

Again: It not unfrequently happens, that there is not even any ſuch reſiſtance or obſtruction excited at the working point of the machine; the whole reſiſtance (if we can with propriety give it that name) ariſes from the neceſſity of giving motion to a quantity of inert and inactive matter. This happens in urging round a heavy fly, as in the coining preſs, in the punching engine, in drawing a body along a horizontal plane without friction, and a few ſimilar caſes. Here the ſmalleſt force whatever, applied at the impelled point, will begin motion in the machine; and the *whole* force ſo applied is conſumed in this ſervice. Such caſes are rare, as the ultimate performance of a machine; but occaſionally, and for a farther purpoſe, they frequently occur; and it is neceſſary to conſider them, becauſe there are many of the moſt important applications of machinery where a very conſiderable part of the force is expended in this part of the general taſk.

Such are the chief circumſtances of diſtinction among the mechanical powers of nature which muſt be attended to, in order to know the motion and performance of a machine. Theſe never occur in the ſtatical conſideration of the machine, but here they are of chief importance.

9
The inertia of the machine itſelf muſt alſo be conſidered,

But farther: The action of the moving power is transferred to the working point through the parts of a machine, which are material, inert, and heavy. Or, to deſcribe it more accurately, before the neceſſary force can be excited at the working point of the machine, the various connecting forces muſt be exerted in the different parts of the machine; and in order that the working point may follow out the impreſſion already made, all the connecting parts or limbs of the machine muſt *be moved*, in different directions, and with different velocities. Force is neceſſary for thus changing the ſtate of all this matter, and frequently a very conſiderable force. Time muſt alſo elapſe before all this can be accompliſhed. This often conſumes, and really waſtes, a great part of the impelling power. Thus, in a crane worked by men walking in a wheel, it acquires motion by ſlow degrees; becauſe, in order to give ſufficient room for the action of the number of men or cattle that are neceſſary, a very capacious wheel muſt be employed, containing a great quantity of inert matter. All of this muſt be put in motion by a very moderate preponderance of the men. It accelerates ſlowly, and the load is raiſed. When it has attained the required height, all this matter, now in conſiderable motion, muſt be ſtopped. This cannot be done in an inſtant with a jolt, which would be very inconvenient, and even hurtful; it is therefore brought to reſt gradually. This alſo conſumes time; nay, the wheel muſt get a motion in the contrary direction, that the load may be lowered into the cart or lighter. This can only be accompliſhed by degrees. Then the tackle muſt be lowered down again for another load, which alſo muſt be done gradually. All this waſtes a great deal both of time and of force, and renders a walking wheel a very improper form for the firſt mover of a crane, or any machine whoſe uſe requires ſuch frequent changes of motion. The ſame thing obtains, although in a lower degree, in the ſteam engine, where the great beam and pump rods, ſometimes weighing very many tons, muſt be made to acquire a very briſk motion in oppoſite directions twice in every working ſtroke. It obtains, in a greater or a leſs degree, in all engines which have a reciprocating motion in any of their parts. Pump mills are of neceſſity ſubjected to this inconvenience. In the famous engine at Marly, about $\frac{19}{20}$ of the whole moving power of ſome of the water wheels is employed in giving a reciprocating motion to a ſet of rods and chains, which extend from the wheels to a ciſtern about three-fourths of a mile diſtant, where they work a ſet of pumps. This engine is, by ſuch injudicious conſtruction, a monument of magnificence, and the ſtruggle of ignorance with the unchangeable laws of Nature. In machines, all the parts of which continue the direction of their motions unchanged, the inertia of a great maſs of matter does no harm; but, on the contrary, contributes to the ſteadineſs of the motion, in ſpite of ſmall inequalities of power or reſiſtance, or unavoidable irregularities of force in the interior parts. But in all reciprocations, it is highly prejudicial to the performance; and therefore conſtructions which admit ſuch reciprocation without neceſſity, are avoided by all intelligent engineers. The mere copying artiſt, indeed, who derives all his knowledge from the common treatiſes of mechanics, will never ſuſpect ſuch imperfections, becauſe they do not occur in the ſtatical conſideration of machines.

10
And its friction.

Laſtly, no machine can move without a mutual rubbing of its parts, at all points of communication; ſuch as the teeth of wheelwork, the wipers and lifts, and the gudgeons of its different axes. In many machines, the ultimate taſk performed by the working point, is either friction, or very much reſembles it. This is the caſe in poliſhing mills, grinding mills, nay in boring mills, ſaw mills, and others. A knowledge of friction, in all its varieties, ſeems therefore abſolutely neceſſary, even for a moderate acquaintance with the principles of machinery. This is a very abſtruſe ſubject; and although a good deal of attention has been paid to it by ſome ingenious men, we do not think that a great deal has been added to our knowledge of it; nor do the experiments which have been made ſeem to us well calculated to lead us to a diſtinct knowledge of its nature and modifications. It has been conſidered chiefly with a view to diminiſh it as much as poſſible in the communicating parts of machinery, and to obtain ſome general rules for aſcertaining the quantity of what unavoidably remains. Mr Amontons, of the Royal Academy of Sciences at Paris, gave us, about the beginning of this century, the chief information that we have on the ſubject. He diſcovered, that the obſtruction which it gave to motion was very nearly proportional to the force by which the rubbing ſurfaces are preſſed together. Thus he found, that a ſmooth oaken board, laid on another ſmooth board of the ſame wood, requires a force nearly equal to one-third of what preſſes the ſurfaces together. Different ſubſtances required different proportions.

11
Meaſure of it by Amontons.

He alſo found, that neither the extent of the rubbing ſurfaces, nor the velocity of the motion, made any conſiderable variation on the obſtruction to motion. Theſe were curious and unexpected reſults. Subſequent obſervations have made ſeveral corrections neceſſary in all theſe propoſitions. This ſubject will be more particularly conſidered in another place; but ſince the deviations from Mr Amontons's rule are not very conſiderable, at leaſt in the caſes which occur in this general conſideration of machines, we ſhall make uſe of it in the mean time. It gives us a very eaſy method of eſtimating the effect of friction on machines. It is a certain proportion of the mutual preſſure of the rubbing ſurfaces, and therefore muſt vary in the ſame proportion with this preſſure. Now, we learn from the principles of ſtatics, that whatever preſſures are exerted on the impelled and working point of the machine, all the preſſures on its different parts have the ſame conſtant proportion to theſe, and vary as theſe vary: Therefore the whole friction of the machine varies in the ſame proportion. But farther, ſince it is found that the friction does not ſenſibly change with the velocity, the force which is juſt ſufficient to overcome the friction, and put the loaded machine in motion, muſt be very nearly the ſame with the force expended in overcoming the friction while the machine is moving with any velocity whatever, and performing work. Therefore if we deduct from the force which juſt puts the loaded machine in motion that part of it which balances the reaction of the impelled point occaſioned by the reſiſtance of the work, or which balances the reſiſtance of the work, the remainder is the part of the impelling power which is employed in overcoming the friction. If indeed the actual reſiſting preſſure of the work varies with the velocity of the working point, all the preſſures, and all the frictions in the different communicating parts of the machine, vary in the ſame proportion. But the law of this variation of working reſiſtance being known, the friction is again aſcertained.

We can now ſtate the dynamical equilibrium of forces in the working machine in two ways. We may either conſider the efficient impelling power as diminiſhed by all that portion which is expended in overcoming the friction, and which only prepares the machine for performing work, or we may conſider the impelling power as entire, and the work as increaſed by the friction of the machine; that is, we may ſuppoſe the machine without friction, and that it is loaded with a quantity of additional reſiſtance acting at the working point. Either of theſe methods will give the ſame reſult, and each has its advantages. We took the laſt method in the ſlight view which we took of this ſubject in the *Encycl.* art. Rotation, n° 64. and ſhall therefore uſe it here.

Suppoſing now this previous knowledge of all theſe variable circumſtances which affect the motion of machines of the rotative kind, ſo that, for any momentary poſition of it while performing work, we know what are the preciſe preſſures acting at the impelled and working points, and the conſtruction of the machine, on which depend the friction, and the momentum of its inertia (expreſſed in the article Rotation by $\int p r^2$); we are now in a condition to determine its motion, or at leaſt its momentary acceleration, competent to that poſition. Therefore,

Let there be a rotative machine, ſo conſtructed, that

while

12 Compoſition of the formula expreſſing the performance of a machine.

while it is performing work, the velocity of its impelled point is to that of its working point as *m* to *n*. It is eaſy to demonſtrate, from the common principles of ſtatics, that if a ſimple wheel and axle be ſubſtituted for it, having the radius of the wheel to that of the axle in the ſame proportion of *m* to *n*, and having the ſame momentum of friction and inertia, and actuated by the ſame preſſures at the impelled and working points, then the velocities of theſe points will be preciſely the ſame as in the given machine.

Let *p* repreſent the intenſity (which may be meaſured by pounds weight) of the preſſure exerted in the moment at the impelled point; and *r* expreſs the preſſure exerted at the working point by the reſiſtance oppoſed by the work that is then performing. This may ariſe from the weight of a body to be raiſed, from the coheſion of timber to be ſawed, &c. Any of theſe reſiſtances may alſo be meaſured by pounds weight; becauſe we know, that a certain number of pounds hung on the ſaw of a ſaw mill, will juſt overcome this coheſion, or overcome it with any degree of ſuperiority. Therefore the impelling power *p*, and the reſiſtance *r*, however differing in kind, may be compared as mere preſſures.

Let *x* repreſent the quantity of inert matter which muſt be urged by the impelling power *p*, with the ſame velocity as the impelled point, in order that this preſſure *p* may really continue to be exerted on that point. Thus, if the impelling power is a quantity of water in the bucket of an overſhot wheel, acting by its weight, this weight cannot impel the wheel except by impelling the water. In this way, *x* may be conſidered as repreſenting the inertia of the impelling power, while *p* repreſents its preſſure on the machine. In like manner, let *y* repreſent the quantity of external inert matter which is really moved with the velocity of the working point in the execution of the taſk performed by the machine.

Whatever be the momentum of the inertia of the machine, we can always aſcertain what quantity of matter, attached to the impelled point, or the working point of the wheel and axle, will require the ſame force to give the wheel the ſame angular motion; that is, which ſhall have the ſame momentum of inertia. Let the quantity *a*, attached to the working point, give this momentum of inertia $a n^2$.

Laſtly, ſuppoſing that the wheel and axle have no friction, let *f* be ſuch a reſiſtance, that if applied to the working point, it ſhall give the ſame obſtruction as the friction of the machine, or require the ſame force at the impelled point to overcome it.

13 Angular motion of the machine.

Theſe things being thus eſtabliſhed, the angular velocity of the wheel and axle, that is, the number of turns, or the portion of a turn, which it will make in a given time, will be proportional to the fraction $\frac{pm - \overline{r+f}\,n}{xm^2 + \overline{a+y}\,n^2}$. (I.)—See Rotation, n° 64, &c. *Encycl.*

Since the whole turns together, the velocities of the different points are as their diſtances from the axis, and may be expreſſed by multiplying the common angular velocity by theſe diſtances. Therefore the above formula, multiplied by *m* or *n*, will give the velocity of the impelled or of the working point. Therefore,

14 Velocity of the impelled point.

Velocity of impelled point $= \frac{pm^2 - \overline{r+f}\,mn.}{xm^2 + \overline{a+y}\,n^2}$ (II.)

15 Velocity of the working point.

Velocity of working point $= \frac{pmn - \overline{r+f}\,n^2}{xm^2 + \overline{a+y}\,n^2}$. (III.)

In order to obtain a clear conception of theſe velocities, we muſt compare them with motions with which we are well acquainted. The propoſition being univerſally true, we may take a caſe where gravity is the ſole power and reſiſtance; where, for example, *p* and *r* are the weights of the water in the bucket of a wheel, and in the tub that is raiſed by it. In this caſe, $p = x$, and $r = y$. We may alſo, for greater ſimplicity, ſuppoſe the machine without inertia and friction. The velocity of *p* is now $\frac{pm^2 - rmn}{pm^2 + rn^2}$.

16 Abſolute meaſure of them.

Let *g* be the velocity which gravity generates in a ſecond. Then it will generate the velocity $g\dot{t}$ in the moment $\dot{t}$. Let $\dot{v}$ be the velocity generated during this moment in *p*, connected as it is with the wheel and axle, and with *r*. This connection produces a change of condition $= g\dot{t} - \dot{v}$. For, had it fallen freely, it would have acquired the velocity $g\dot{t}$, whereas it only acquires the velocity $\dot{v}$. In like manner, had *r* fallen freely, it would have acquired the velocity $g\dot{t}$. But, inſtead of this, it is raiſed with the velocity $\frac{n}{m}\dot{v}$. The change on it is therefore $= g\dot{t} + \frac{n}{m}\dot{v}$. Theſe changes of mechanical condition ariſe from their connection with the corporeal machine. Their preſſures on it bring into action its connecting forces, and each of the two external forces is in immediate equilibrium with the force exerted by the other. The force excited at the impelled point, by *r* acting at the working point, may be called the momentum or energy of *r*. Theſe energies are preciſely competent to the production of the changes which they really produce, and muſt therefore be conceived as having the ſame proportions. They are therefore equal and oppoſite, by the general laws *obſerved* in all actions of tangible matter; that is, they are ſuch as balance each other. Thus, and only thus, the remaining motions are what we obſerve them to be.

That is, $p \times \overline{g\dot{t} - \dot{v}} \times m = r \times \overline{gt + \frac{n}{m}\dot{v}} \times n$

Or $pmg\dot{t} - pm\dot{v} = rng\dot{t} + r\frac{n^2}{m}\dot{v}$

Or $pm^2g\dot{t} - pm^2\dot{v} = rmng\dot{t} + rn^2\dot{v}$

Or $\overline{pm^2 - rmn} \times g\dot{t} = \overline{pm^2 + rn^2} \times \dot{v}$

That is, $pm^2 + rn^2 : pm^2 - rmn = g\dot{t} : \dot{v}$

That is, *the denominator of the fraction, expreſſing the velocity of the impelled point, is to the numerator as the velocity which a heavy body would acquire in the moment* $\dot{t}$, *by falling freely, is to the velocity which the impelled point acquires in that moment.* The ſame thing is true of the velocity of the working point.

This reaſoning ſuffers no change from the more complicated nature of the general propoſition. Here the impelling power is ſtill *p*, but the matter to be accelerated by it at the working point is $a + y$, while its reaction, diminiſhing the impelling power, is only *r*. We have only to conſider, in this caſe, the velocity with which $a + y$ would fall freely when impelled, not by $a + y$, but only by *r*. The reſult would be the ſame;

$g\dot{t}$ would ſtill be to $\dot{v}$ as the denominator of the ſame fraction to its numerator.

Thus have we diſcovered the momentary acceleration of our machine. It is evident, that if the preſſures p and r, and the friction and inertia of the machine, and the external matter, continue the ſame, the acceleration will continue the ſame; the motion of rotation will be uniformly accelerated, and $pm^2+\overline{a+y}\,n^2$ will be to $pm^2-\overline{r+f}\,mn$ as the ſpace s, through which a heavy body would fall in any given time, t, is to the ſpace through which the impelled point will really have moved in the ſame time. In like manner, the ſpace through which the working point moves in the ſame time is $=\frac{pmn-\overline{r+f}\,n^2}{pm^2+\overline{a+y}\,n^2}s$.

Thus are the motions of the working machine determined. We may illuſtrate it by a very ſimple example. Suppoſe a weight p of five pounds, deſcending from a pulley, and dragging up another weight r of three pounds on the other ſide. m and n are equal, and each may be called 1. The formula becomes $\frac{p-r}{p+r}s$, or $\frac{5-3}{5+3}s$, or $\frac{2}{8}$, $=\frac{1}{4}s$. Therefore, in a ſecond, the weight p will deſcend $\frac{1}{4}$th of 16 feet, or 4 feet; and will acquire the velocity of 8 feet per ſecond.

17 Performance of the machine. Having obtained a knowledge of the velocity of every point of the machine, we can eaſily aſcertain its performance. This depends on a combination of the quantity of reſiſtance that is overcome at the working point, and the velocity with which it is overcome. Thus, in raiſing water, it depends on the quantity (proportional to the weight) of water in the bucket or pump, and the velocity with which it is lifted up. This will be had by multiplying the third formula by r, or by $rg\dot{t}$, or by rs. Therefore we obtain this expreſſion,

$$\text{Work done} = \frac{pmrn-\overline{r+f}\,rn^2}{pm^2+\overline{a+y}\,n^2}\,g\dot{t}. \quad \text{(IV.)}$$

Such is the general expreſſion of the momentary performance of the machine, including every circumſtance which can affect it. But a variation of thoſe circumſtances produces great changes in the reſults. Theſe muſt be diſtinctly noticed.

Cor. 1. If $pmrn$ be equal to $\overline{r+f}\,rn^2$, there will be no work done, becauſe the numerator of the fraction is annihilated. There is then no unbalanced force, and the natural power is only able to balance the preſſure propagated from the working point to the impelled point.

2. In like manner, if $n=0$, no work is done altho' the machine turns round. The working point has no motion. For the ſame reaſon, if m be infinitely great, although there is a great prevalence of impelling momentum, there will not be any ſenſible performance during a finite time. For the velocity which p can impreſs is a finite quantity, and the impelled point cannot move faſter than x would be moved by it if detached from the machine. Now when the infinitely remote impelled point is moved through any finite ſpace, the motion of the working point muſt be infinitely leſs, or nothing, and no work will be done.

Remark. We ſee that there are two values of n, viz. v, and $m\times\frac{p}{r}$, which give no performance. But in all other proportions of m and n ſome work is done. Therefore, as we gradually vary the proportion of m to n, we obtain a ſeries of values expreſſing the performance, which muſt gradually increaſe from nothing, and then decreaſe to nothing. There muſt therefore be ſome proportion of m to n, depending on the proportion of p to $r+f$, and of x to $a+y$, which will give the greateſt poſſible value of the performance. And, on the other hand, if the proportion of m to n be already determined by the conſtruction of the machine already erected, there muſt be ſome proportion of p to $\overline{r+f}$, and of x to $a+y$, by which the greateſt performance of a machine may be enſured. It is evident, that the determination of theſe two proportions is of the utmoſt importance to the improvement of machines. The well informed reader will pardon us for endeavouring to make this appear more forcibly to thoſe who are leſs inſtructed, by means of ſome very ſimple examples of the firſt principle.

Suppoſe that we have a ſtream of water affording three tons per minute, and that we want to drain a pit which receives one ton per minute, and that this is to be done by a wheel and axle? We wiſh to know the beſt proportion of their diameters m and n. Let m be taken $=6$; and ſuppoſe,

1. That $n=5$.

Then $\frac{pmrn-r^2n^2}{pm^2+rn^2}=\frac{3.6.1.5-1.25}{3.36+1.36}, =\frac{65}{133}, =0,4887$

2. Let n be $=6$. The formula is $=0,5$.

3. Let $n=7$. The formula is $=0,49045$. Hence we find, that the performance is greater when n is 6, than when it is either 5 or 7.

As an example of the ſecond principle, ſuppoſe the machine a ſimple pulley, and let p be 10.

1. Let r be $=3$. The formula is $\frac{10\times 3-9}{10+3}, =\frac{21}{13}, =1,6154$.

2. Let r be $=4$. The formula is $=\frac{10\times 4-16}{10+4}, =\frac{24}{14}, =1,7143$.

3. Let r be $=5$. The formula is $=\frac{10\times 5-25}{10+5}, =\frac{25}{15}, =1,6666$. Here it appears, that more work is done when r is 4 than when it is 5 or 3.

It muſt therefore be allowed to be one of the moſt important problems in practical mechanics to determine that conſtruction by which a given power ſhall overcome a given reſiſtance with the greateſt advantage, and the proportion of work which ſhould be given to a machine already conſtructed ſo as to gain a ſimilar end.

18 Proportion of the machine which gives the greateſt work. I. The general determination of the firſt queſtion has but little difficulty. We muſt conſider n as the variable magnitude in the formula $\frac{pmrn-\overline{r+f}\,rn^2}{pm^2+\overline{a+y}\,n^2}$, which expreſſes the work done; and find its value when the formula is a maximum. Taking this method, we ſhall find that the formula IV. is a maximum when n is

$$= m\,\frac{\sqrt{x^2(r+f)^2+p^2x(a+y)}-x(r+f)}{p(a+y)}.$$

This expreſſion of the performance, in its beſt ſtate, appears pretty complex; but it becomes much more ſimple in all the particular applications of it, as the circumſtances of the caſe occur in practice.

We have obtained a value of n expreſſed in parts of m. If we ſubſtitute this for n in the third formula, we obtain the greateſt velocity with which the reſiſtance r, connected with the inertia y, can be overcome by the power p, connected with the inertia x, by the intervention of a machine, whoſe momentum of inertia and friction are $a n^2$ and $f n$. This is $= \frac{r+f}{2a+y} \times \left(\sqrt{\frac{p^2\, \overline{a+y}}{\overline{r+f}^2\, x} + 1} - 1\right) g\,t$. This expreſſes the velocity of the working point in feet per ſecond, and therefore the actual performance of the machine.

But the proper proportion of m to n, aſcertained by this proceſs, varies exceedingly, according to the nature both of the impelling power, and of the work to be performed by the machine.

1. It frequently happens that the work exerts no contrary ſtrain on the machine, and conſiſts merely in impelling a body which reſiſts only by its inertia. This is the caſe in urging round a millſtone or a heavy fly; in urging a body along a horizontal plane, &c. In this caſe r does not enter into the formula, which now becomes $m \times \frac{\sqrt{x^2 f^2 + p^2 x (a+y)} - x f}{p (a+y)}$. If the friction be inſignificant we may take $n = m \sqrt{\frac{p^2 x (a+y)}{p^2 (a+y)^2}}$ $= m \sqrt{\frac{x}{a+y}}$. The velocity of the working point is nearly $= \frac{p}{2 \sqrt{x\, \overline{a+y}}}$. In this caſe, it will be found that the velocity acquired at the end of a given time will be nearly in the proportion of the power applied to the machine.

2. On the other hand, and more frequently, the inertia of the external matter which muſt be moved in performing the work need not be regarded. Thus, in the grinding of grain, ſawing of timber, boring of cylinders, &c. the quantity of motion communicated to the flour, to the ſaw duſt, &c. is too inſignificant to be taken into the account. In this caſe, y vaniſhes from the formula, which becomes extremely ſimple when the friction and inertia of the machine are inconſiderable. We ſhall not be far from the truth if we make m to n as $2r$ to p, or $n = m \times \frac{p}{2r+f}$. In this caſe, the velocity of the working point is $\frac{p^2}{4x(r+f) + \frac{a p^2}{4(r+f)}}$.

But it is rare that machines of this kind have a ſmall inertia. They are generally very ponderous and powerful; and the force which is neceſſary for generating even a very moderate motion in the unloaded machine (that is, unloaded with any work), bears a great proportion to the force neceſſary for overcoming the reſiſtance oppoſed by the work. The formula muſt therefore be uſed in all the terms, becauſe a is joined with y. It would have been ſimpler in this particular, had a been joined with x in the expreſſion of the angular velocity.

3. In ſome caſes we need not attend to the inertia of the power, as in the ſteam engine. In this caſe, if taken ſtrictly, n appears to have no value, becauſe x is a factor of every term of the numerator. But the formula gives this general indication, that the more inſignificant the inertia of the moving power is ſuppoſed, the larger ſhould m be in proportion to n; provided always, that the impelling power is not, by its nature, greatly diminiſhed, by giving ſo great a velocity to the impelled point. This circumſtance will be particularly conſidered afterwards.

4. If the inertia of the power and the reſiſtance be proportional to their preſſures, as when the impelling power is water lying in the buckets of an overſhot wheel, and the work is the raiſing of water, minerals, or other heavy body, acting *only* by its weight; then p and r may be ſubſtituted for x and y, and the formula expreſſing the value of n, when the performance is a maximum, becomes

$$n = m\, \frac{\sqrt{p^2 \times \overline{r+f}^2 + p^3 \times \overline{a+r}} - p \times \overline{r+f}}{p \times \overline{a+r}}.$$

If, in this caſe, the inertia and friction of the machine may be diſregarded, as may often be done in pulleys, we have

$$n = m \sqrt{\frac{p}{r} + 1} - 1.$$

If we make m the unit of the radii, and r the unit of force, we have

$$n = \sqrt{p+1} - 1, \text{ in parts of } m = 1.$$

Or, making $p = 1$, we have $n = \sqrt{\frac{1}{r} + 1} - 1$.

Theſe very ſimple expreſſions are of conſiderable uſe, even in caſes where the inertia of the machine is very conſiderable, provided that it have no reciprocating motions. A ſimple wheel and axle, or a train of good wheelwork, have very moderate friction. The general reſults, therefore, which even very unlettered readers can deduce from theſe ſimple formulæ, will give notions that are uſeful in the caſes which they cannot ſo thoroughly comprehend. Some ſervice of this kind may be derived from the following little table of the beſt proportions of m to n, correſponding to the proportions of the power furniſhed to the engineer, and the reſiſtance which muſt be overcome by it. The quantity r is always $= 10$, and $m = 1$.

p	n	p	n
1	0,0488	10	0,4142
2	0,0954	20	0,7321
3	0,1402	30	1,
4	0,1832	40	1,2362
5	0,2246	50	1,4495
6	0,2649	60	1,6457
7	0,3038	70	1,8284
8	0,3416	80	2,
9	0,3784	90	2,1623
10	0,4142	100	2,3166

This muſt ſuffice for a very general view of the firſt problem.

II. The next queſtion is not leſs momentous, namely, to

19 Beſt proportion of the power and work.

to determine for a machine of a given conſtruction that proportion of the reſiſtance at the working point to the impelling power which will enſure the greateſt performance of the machine; that is, the proportion of m to n being given, to find the beſt proportion of p to r.

This is a much more complicated problem than the other; for here we have to attend to the variations both of the preſſures p and r, and alſo of the external matters x and y, which are generally connected with them. It will not be ſufficient therefore to treat the queſtion by the uſual fluxionary proceſs for determining the maximum, in which r is conſidered as the only varying quantity. We muſt, in this curſory diſcuſſion, reſt ſatisfied with a comprehenſion of the circumſtances which moſt generally prevail in practice.

It muſt either happen, that when r changes, there is no change (that is, of moment) in the maſs of external matter which muſt be moved in performing the work, or that there is alſo a change in this circumſtance. If no change happens, the denominator of the fourth formula, expreſſing the performance, remains the ſame; and then the formula attains a maximum when the numerator $prmn - \overline{r+f}\,rn^2$ is a maximum. Alſo, we may include f without complicating the proceſs, by the conſideration, that f is always in nearly the ſame ratio to r; and therefore $r+f$ may be conſidered as a certain multiple of r, ſuch as br. We may therefore omit f in the fluxionary equations for obtaining the maximum, and then, in computing the performance, divide the whole by b. Thus if the whole friction be $\frac{1}{20}$th of the reſiſting preſſure r, we have $r+f=\frac{21}{20}$ of r, and $b=\frac{21}{20}$. Having aſcertained the beſt value for r, we put this in its place in the fourth formula, and take $\frac{20}{21}$ of this for the performance. This will never differ much from the truth.

This proceſs gives us $pmn = 2n^2r$, and $r=\frac{pmn}{2n^2}$, $=\frac{pm}{2n}$; and if we farther ſimplify the proceſs, by making $p=1$, and $m=1$, we have $r=\frac{1}{2n}$; a moſt ſimple expreſſion, directing us to make the reſiſtance one half of what would balance the impelling power by the intervention of the machine.

This will evidently apply to many very important caſes, namely, to all thoſe in which the matter put in motion by the working point is but trifling.

But it alſo happens in many important caſes, that the change is at leaſt equally conſiderable in the inertia of the work. In this caſe it is very difficult to obtain a general ſolution. But we can hardly imagine ſuch a change, without ſuppoſing that the inertia of the work varies in the ſame proportion as the preſſure excited by it at the working point of the machine; for ſince r continues the ſame in kind, it can rarely change but by a proportional change of the matter with which it is connected. Yet ſome very important caſes occur where this does not happen. Such is a machine which forces water along a long main pipe. The reſiſtance to motion and the quantity of water do not follow nearly the ſame ratio. But in the caſes in which this ratio is obſerved, we may repreſent y by any multiple br of r, which the caſe in hand gives us; b being a number, integer, or fractional. In the farther treatment of this caſe, we think it more convenient to free r from all other combinations; and inſtead of ſuppoſing the force f (which we made equivalent with the friction of the machine) to be applied at the working point, we may apply it at the impelled point, making the effective power $q=p-f$. For the ſame reaſons, inſtead of making the momentum of the machine's inertia $=an^2$, we may make it am^2, and make $a+x=z$. Now, ſuppoſing q, or $p-f$, $=1$, and alſo $m=1$, our formula expreſſing the performance becomes $\frac{rn-r^2n^2}{z+brn^2}$. This is a maximum when

$$r=\frac{\sqrt{z^2+zbn}-z}{bn^2}.$$

Cor. 1. If the inertia of the work is always equal to its preſſure, as when the work conſiſts wholly in raiſing a weight, ſuch as drawing water, &c. then $b=1$, and the formula for the maximum performance becomes

$$r=\frac{\sqrt{zn+z^2}-z}{n^2}.$$

2. If the inertia of the impelling power is alſo the ſame with its preſſure, and if we may neglect the inertia and friction of the machine, the formula becomes

$$r=\frac{\sqrt{n+1}-1}{n^2}.$$

Example. Let the machine be a common pulley, ſo that the radii m and n are equal, and therefore $n=1$. Then, $r=\frac{\sqrt{1+1}-1}{1}$, $=\sqrt{2}-1$, $=0{,}4142$, &c. more than $\frac{2}{5}$ths of what would balance it.

Here follows a ſeries of the beſt values of r, correſponding to different values of n. m and p are each $=1$. The numbers in the laſt column have the ſame proportion to 1 which r has to the reſiſtance which will balance p.

$n=\frac{1}{4}$	$r=1{,}8885$	0,4724 to 1
$\frac{1}{3}$	1,3928	0,4639
$\frac{1}{2}$	0,8986	0,4493
1	0,4142	0,4142
2	0,1830	0,3660
3	0 1111	0,3333
4	0,0772	0,3088

General but erroneous maxim.

From what has now been eſtabliſhed, we ſee with ſufficient evidence the importance of the higher mathematics to the ſcience of mechanics. If the velocities of the impelled and working points of an engine are not properly adjuſted to the preſſures, the inertia, and the friction of the machine, we do not derive all the advantages which we might from our ſituation. Hence alſo we learn the falſity of the maxim which has been received as well founded, that the augmentation of intenſity of any force, by applying it to the long arm of a lever, is always fully compenſated by a loſs of time; or, as it is uſually expreſſed, "what we gain by a machine in force we loſe in time." If the proportion of m to n is well choſen, we ſhall find that the work done, when it reſiſts by its inertia only, increaſes nearly in the proportion of the power employed; whereas when the inertia of the work is but a ſmall part of the reſiſtance, it increaſes nearly in the duplicate ratio of the power employed.

It was remarked, in the ſetting out in the preſent problem, that the formulæ do not immediately expreſs the velocity of any point of the machine, but its momentary acceleration. But this is enough for our purpoſe; becauſe, when the momentary acceleration is a maximum, the velocity acquired, and the ſpace deſcribed, in any given time, is alſo a maximum. We alſo ſhewed how the real velocities, and the ſpaces deſcribed, may be aſcertained in known meaſures. We may ſay in general, that if g repreſent the preſſure of gravity on any maſs of matter w, then $\frac{g}{w}$ is to $\frac{pmn-\overline{r+f}n}{am^2+\overline{a+y}n^2}$ as 16 feet to the ſpace deſcribed in a ſecond by the working point in a ſecond, or as 32 feet per ſecond is to the velocity acquired in that time.

20
Cauſes why machines do not continually accelerate.

A remark now remains to be made, which is of the greateſt conſequence, and gives an unexpected turn to the whole of the preceding doctrines. It appears, from all that has been ſaid, that the motion of a machine muſt be uniformly accelerated, and that any point will deſcribe ſpaces proportional to the ſquares of the times; for while the preſſures, friction, and momentum of inertia remain the ſame, the momentary acceleration muſt alſo be invariable. But this ſeems contrary to all experience. Such machines as are properly conſtructed, and work without jolts, are obſerved to quicken their pace for a few ſeconds after ſtarting; but all of them, in a very moderate time, acquire a motion that is ſenſibly uniform. Is our theory erroneous, or what are the circumſtances which remain to be conſidered, in order to make it agree with obſervation? The ſcience of machines is imperfect, till we have explained the cauſes of this deviation from the theory of uniform acceleration.

Theſe cauſes are various.

1. Increaſe of friction.

1. In ſome caſes, every increaſe of velocity of the machine produces an increaſe of friction in all its communicating parts. By theſe means, the accelerating force, which is $pm-\overline{r+f}n$, or $\overline{p-f}m-rn$, is diminiſhed, and conſequently the acceleration is diminiſhed. But it ſeldom happens that friction takes away or employs the whole accelerating force. We are not yet well inſtructed in the nature of friction. Moſt of the kinds of friction which obtain in the communicating parts of machines, are ſuch as do not ſenſibly increaſe by an increaſe of velocity; ſome of them really diminiſh. Yet even the moſt accurately conſtructed machines, unloaded with work, attain a motion that is ſenſibly uniform. If we take off the pallets from a pendulum clock, and allow it to run down amain, it accelerates for a while, but in a very moderate time it acquires an uniform motion. So does a common kitchen jack. Theſe two machines ſeem to bid the faireſt of any for an uniformly accelerated motion; for their impelling power acts with the utmoſt uniformity. There is ſomething yet unexplained in the nature of friction, which takes away ſome of this acceleration.

2. Reſiſtance of air.

But the chief cauſe of its ceſſation in theſe two inſtances, and others *of very rapid motion*, is the reſiſtance of the air. This ariſes from the motion which is communicated to the air diſplaced by the ſwift moving parts of the machine. At firſt it is very ſmall; but it increaſes nearly in the duplicate ratio of the velocity (ſee *Resistance of Fluids*, Encycl.). Thus r increaſes continually; and, in a certain ſtate of motion, $\overline{r+f}n$ becomes equal to pm. Whenever this happens, the accelerating power is at an end. The acceleration alſo ceaſes; and the machine is in a ſtate of dynamical equilibrium; not at reſt, but moving uniformly, and performing work.

3. Increaſe of reſiſtance very imperfectly known.

Still, however, this is not one of the general cauſes of the uniform motion attained by working engines. Rarely is the motion of their parts ſo rapid, as to occaſion any great reſiſtance from the air. But in the moſt frequent employments of machines, every increaſe of velocity is accompanied by an increaſe of reſiſtance from the work performed. This occurs at once to the imagination; and few perſons think of inquiring farther for a reaſon. But there is perhaps no part of mechanics that is more imperfectly underſtood, even in our preſent improved ſtate of mechanical ſcience. In many kinds of work, it is very difficult to ſtate what increaſe of labour is required in order to perform the work with twice or thrice the ſpeed. In grinding corn, for inſtance, we are almoſt entirely ignorant of this matter. It is very certain, that twice the force is not neceſſary for making the mill grind twice as faſt, nor even for making it grind twice as much grain equally well. It is not eaſy to bring this operation under mathematical treatment; but we have conſidered it with ſome attention, and we imagine that a very great improvement may ſtill be made in the conſtruction of griſt mills, founded on the law of variation of the reſiſtance to the operation of grinding, and a ſcientific adjuſtment of m to n, in conſequence of our knowledge of this law. We may make a ſimilar obſervation on many other kinds of work performed by machines. In none of thoſe works where the inertia of the work is inconſiderable, are we well acquainted with the real mechanical proceſs in performing it. This is the caſe in ſawing mills, boring mills, rolling mills, ſlitting mills, and many others, where the work conſiſts in overcoming the ſtrong coheſion of a ſmall quantity of matter. In ſawing timber (which is the moſt eaſily underſtood of all theſe operations), if the ſaw move with a double velocity, it is very difficult to ſay how much the actual reſiſting preſſure on the teeth of the ſaw is increaſed. Twice the number of fibres are neceſſarily torn aſunder during the ſame time, becauſe the ſame number are torn by one deſcent of the ſaw, and it makes that ſtroke in half the time. But it is very uncertain whether the reſiſtance is double on this account; becauſe if each fibre be ſuppoſed to have the ſame tenacity in both caſes, it reſiſts with this tenacity only for half the time. The parts of bodies reſiſt a ſimilar change of condition in different manners; and there is another difference in their reſiſtance of different changes—the reſiſtance of red hot iron under the roller may vary at a very different rate from that of its reſiſtance to the cutting tool. The reſiſtance of the ſpindles of a cotton mill, ariſing partly from friction, partly from the inertia of the heaped bobbins, and partly from the reſiſtance of the air, is ſtill more complicated, and it may be difficult to learn its law. The only caſe in which we can judge with ſome preciſion is, when the inertia of matter, or a conſtant preſſure like that of gravity, conſtitutes the chief reſiſtance. Thus in a mill employed to raiſe water by a chain of buckets, the reſiſtance proceeds from the inertia only of the water. The buckets are moving with a certain velocity, and the loweſt of them takes hold of a quantity of water lying at reſt in the pit, and drags it into motion with its acquired velocity. The force required for generating this motion on the quieſcent water muſt be double or triple, when the velocity that muſt be given to it is ſo. This abſorbs the overplus of the impelling power, by which that power exceeds what is neceſſary for balancing the weight of the water contained in all the aſcending buckets. This is a certain determinate quantity which does not change; for in the ſame inſtant that a new bucket of water is forced into motion below, and its weight added to that of the aſcending buckets, an equal bucket is emptied of its water at top. The aſcending buckets require only to be balanced, and they then *continue* to aſcend, with any velocity already acquired. While the machine moves ſlow, the motion impreſſed on the new bucket of water is not ſufficient to abſorb all the overplus of impelling power. The quantity not abſorbed accelerates the machine, and the next bucket muſt produce more motion in the water which it takes up. This conſumes more of the overplus. This goes on till no overplus of power is left, and the machine accelerates no more. The complete performance of the machine now is, that "a certain quantity of water, formerly at reſt, is now moving with a certain velocity." Our engineers conſider it differently; "as a certain *weight* of water lifted up." But while the machine is thus moving uniformly, it is really not doing ſo much as before; that is, it is not exerting ſuch great preſſures as before the motion was rendered uniform: for at that time there was a preſſure at the working point equal to the weight of all the water in the aſcending buckets; and alſo an overplus of preſſure, by which the whole was accelerated. In the ſtate of uniform motion, the preſſure is no more than juſt balances the weight of the aſcending chain. We ſhall learn by and bye how the preſſures have been diminiſhing, although the mill has been accelerating; a thing that ſeems a paradox.

In this inſtance, then, we ſee clearly, why a machine muſt attain a uniform motion. A pumping machine gives us the ſame opportunity, but in a manner ſo different as to require explanation. The piſton may be ſuppoſed at the very ſurface of the pit water, and the impelling power may be leſs than will ſupport a column in the pipe as high as can be raiſed by the preſſure of the atmoſphere. Suppoſe the impelling power to be the water lying in the buckets of an overſhot wheel. Let this water be laid into the buckets by a very ſmall ſtream. It will fill the buckets very ſlowly; and as this gives them a preponderance, the mill loſes its balance, the wheel begins to move, and the piſton to riſe, and the water to follow it. The water may be delivered on the wheel drop by drop; the piſton will riſe by inſenſible degrees, always ſtanding ſtill again as ſoon as the atmoſpheric preſſure on it juſt balances the water on the wheel. The water in the riſing pipe is always a balance to the preſſure of the atmoſphere on the ciſtern; therefore the preſſure of the atmoſphere on the piſton (which is the *r* in our formula) is equal to the weight of this water. Our pump-makers therefore (calling themſelves engineers) ſay, that the weight of water in the pipe balances the water on the wheel. It does not balance it, nor is it raiſed by the wheel, but by the atmoſphere; but it ſerves us at preſent for a meaſure of the power of the wheel. At laſt, all the buckets of the wheel are full, and the water is (for example) 25 feet high in the pipe. Now let the ſtream of water run its full quantity. It will only run over from bucket to bucket, and run off at the bottom of the wheel; but the mill will not move, and no work will be performed. (N. B. We are here excluding all impulſe or ſtroke on the buckets, and ſuppoſing the water to act only by its weight.) But now let all be emptied again, and let the water be delivered on the wheel in its full quantity at the firſt. The wheel will immediately acquire a preponderancy, which will *greatly* exceed the firſt ſmall preſſure of the atmoſphere on the piſton. It will therefore accelerate the piſton, overcoming the preſſure of the air with great velocity. The piſton riſes faſt; the water follows it, by the preſſure of the atmoſphere; and when it attains the former utmoſt height, it attains it with a conſiderable velocity. If allowed to run off there, it will *continue* to run off with that velocity; becauſe there is the ſame quantity of water preſſing round the wheel as before, and therefore enough to balance the preſſure of the atmoſphere on the piſton. The preſſure of the ſame atmoſphere on the water in the ciſtern, raiſed the water in the pipe with this velocity; therefore it will continue to do ſo, and the mill will deliver water by the pump with this velocity, although there is no more preſſure acting on it than before, when the water ran to waſte, doing no work whatever.

This mode of action is extremely different from the former example. The mill is not acting againſt the inertia *y* of the water to be moved, but againſt the preſſure *r* of the atmoſphere on the piſton. The preſſure of the ſame atmoſphere on the ciſtern is employed againſt the inertia of the water in the pipe; and the uſe of the mill is to *give occaſion*, by raiſing the piſton, to the exertion of this atmoſpherical preſſure, which is the real raiſer of the water. The maxim of conſtruction, and the proper adjuſtment of *m* to *n* in this caſe, are different from the former; and we ſhould run the riſk of making an imperfect engine were we to confound them.

We muſt mention another caſe of a pumping mill, ſeemingly the ſame with this, but eſſentially different. Suppoſe the pipe of this pump to reach 30 feet below the ſurface of the pit water, and that the piſton is at the very bottom of it. Suppoſe alſo, that the wheel buckets, when filled with water, only enable it to *ſupport* 25 feet of water in the riſing pipe. Let the water be delivered into the wheel drop by drop. The wheel will gradually preponderate; the piſton will gradually riſe, lifting the water above it, ſuſtaining a preſſure of water which gradually increaſes. At laſt, the water in the pump is 25 feet higher than that in the ciſtern; the wheel is full and running to waſte; but no work is performed. Let all be emptied, and now let the water come to the wheel in its full ſtream, but without impulſe. The piſton will lift the water briſkly, bring it to 25 feet high with a conſiderable velocity, and the mill will now raiſe it with this velocity. In this example, the mill is the immediate agent in raiſing the water; but, in this caſe alſo, its ultimate office is not overcoming inertia, but overcoming preſſure. It was the overplus of power only that was employed in overcoming inertia, while accelerating the water in the riſing pipe, in order to give it the neceſſary velocity for a continued diſcharge.

21.

Theſe and ſimilar examples ſhew the great difference between the ſtatical and dynamical equilibrium of machines, and the neceſſity of a ſcientific attention by all who wiſh to improve practical mechanics. Without this, and even a pretty refined attention, we cannot ſee the connection between a copious ſupply of water to the bucket wheel and a plentiful diſcharge by the pump. We believe, that the greateſt part of thoſe employed in erecting machines conceive it as owing to the greater weight of water impelling the wheel with greater force; but we ſee that there is no difference in the preſſures on the mill at reſt, and the mill doing its work ſteadily and uniformly, with any velocity, however great. Without keeping the notions of that part of the impelling power which ſupports diſtinct from that of the part which accelerates, we ſhall never have a clear conception of the operation of machines, or of mechanical power in general. We cannot derive all the advantages of our natural powers, without knowing how our machine employs the preſſure excited by it at the working point; that is, without perceiving in what caſes it is oppoſed to inertia, and in what to the mechanical properties of tangible matter. This only can inform us at what rate the reſiſtance varies by a change of velocity; and when it happens that this augmentation, neceſſarily accompanied by an augmentation of all the frictions, and the reſiſtance of the air, is in equilibrio with the whole of the impelling power, and all acceleration is at an end.

22
The chief cauſe is a real diminution of power.

Laſtly, another chief cauſe of the finally uniform motion of machines is, that, in moſt caſes, an increaſe of velocity produces a real diminution of impelling power. We hardly know any exception to this beſides the employment of *one* deſcending weight as a power or firſt mover. Moſt of the powers which we employ reſide in bodies external to the machine; and theſe bodies muſt be put in motion, and continued in that motion, in order to continue their preſſure on the impelled point. Frequently a great part of the power is employed in giving this neceſſary motion to the external matter, and the remainder only is employed in preſſing forward the machine. We mentioned a remarkable inſtance of this in the operation of thraſhing. Now, the power thus employed muſt increaſe in proportion to the motion required; that is, in proportion to the velocity of the impelled point; what remains, urging forward the machine, is therefore diminiſhed. The acceleration is therefore diminiſhed, and may ceaſe. At *laſt* the actual preſſure is ſo much diminiſhed, that it is no more than what is neceſſary for overcoming the increaſed reſiſtance of the work, the increaſed friction. The machine therefore accelerates no more, but moves uniformly.

This cauſe very general.

This cauſe of the diminution of power by an increaſe of velocity, obtains in all caſes where the ſtrength of animals, of ſprings, the force of fired gunpowder, &c. is exerted. In ſome caſes, the viſible effect is not very conſiderable; as in the employment of a ſtrong ſpring, the force of gunpowder, and a few others. In the action of animals, this defalcation of power is very great when the velocity is conſiderable. Nay, even in the action of gravity, although it acts as ſtrongly on a body in rapid motion as on one at reſt, yet when gravity is not the immediate agent, but acts by the intervention of a body in which it reſides, the neceſſity of previouſly moving this body frequently diminiſhes the acceleration which it would otherwiſe produce. Thus, in an overſhot wheel, if the water be delivered into the bucket with a velocity (eſtimated in the direction of the part of the wheel into which it is delivered) leſs than that of the rim of the wheel, it muſt retard the motion; for it muſt be immediately dragged into that motion; that is, part of the accelerating overplus, already acting on the wheel, muſt be employed in accelerating this new bucket of water, and this muſt leſſen the general acceleration of the machine. Hence we learn, that the water muſt be delivered on the wheel with a velocity that is at leaſt not leſs than that of the wheel's motion.

It obtains in all machines actuated by impulſion,

The caſe in which we ſee this diminution of power on machines moſt diſtinctly is, when water or wind, acting by impulſe alone, is our moving power. Since the mutual impulſes of bodies depend entirely on their relative motions (ſee IMPULSION, *Suppl.*), it follows, that when the velocity of the impelled point is augmented, the impulſion, or effective preſſure, muſt be diminiſhed. Nay, this velocity may be ſo increaſed, that there ſhall be no relative motion, and therefore no impulſion. If the floats of an underſhot wheel be moving with the velocity of the ſtream, they remain conjoined in their progreſs, but without any mutual action. Therefore, when an underſhot wheel is ſet into a running water, the firſt impulſions are ſtrong, and accelerate the wheel. This diminiſhes the next impulſion and acceleration: but the wheel is ſtill impelled and accelerated; leſs and leſs in every ſucceeding moment, as it moves faſter; by and bye, the acceleration becomes inſenſible, and the wheel appears to attain a motion which is perfectly uniform. This requires a very long time, or rather it is never attained, and we only cannot diſcern the very ſmall additions which are ſtill made to the velocity. All this happens generally after a very moderate time, by reaſon of various other obſtructions.

Or by the force of animals.

Animal action is ſubject to the ſame variation. We know, that there is a certain rate at which a horſe can run, exhauſting or employing his whole ſtrength. If he be made to drag any the ſmalleſt load after him, he muſt employ part of his force on it, and his ſpeed will be checked. The more he is loaded with a draught, the ſlower he will run, ſtill employing all his ſtrength. The draught may be increaſed till he is reduced to a trot, to a walk, nay, till he is unable to draw it. Now, juſt inverting this proceſs, we ſee, that there is a certain ſtrain which will ſufficiently tire the horſe without ſtirring from the ſpot, but which he could continue to exert for hours. This is greater than the load that he can juſt crawl along with, employing his ſtrength as much as would be prudent to continue from day to day. And, in like manner, every leſſer draught has a correſponding rate, at which the horſe, employing his whole working ſtrength, can continue to draw at during the working hours of a day. At ſetting out, he pulls harder, and accelerates it. Following his pull, he walks faſter, and therefore pulls leſs (becauſe we are ſtill ſuppoſing him to employ his whole working ſtrength). At laſt he attains that ſpeed which occupies his whole ſtrength in merely continuing the pull.

Other animals act in a ſimilar manner; and it becomes a general rule, that the preſſure actually exerted on the impelled point of a machine diminiſhes as its velocity increaſes.

23
We muſt diſtinguiſh between the power expended and the power employed.

From the concurrence of ſo many facts, we perceive that we muſt be careful to diſtinguiſh between the quantity of power expended, and the quantity that is uſefully employed, which muſt be meaſured ſolely by the preſſure exerted on the machine. When a weight of five pounds is employed to drag up a weight of three pounds by means of a thread over a pulley, it deſcends, with a motion uniformly accelerated, four feet in the firſt ſecond. Mr Smeaton would call this an expenditure of a mechanical power 20. The weight three pounds is raiſed four feet. Mr Smeaton would call this a mechanical effect 12. Therefore the effect produced is not adequate to the power expended. But the fact is, that the preſſure, ſtrain, or mechanical power really exerted in this experiment, is neither five nor three pounds; the five pound weight would have fallen 16 feet, but it falls only 4. A force has therefore acted on it ſufficient to make it deſcribe 12 feet in a ſecond, with a uniformly accelerated motion; for it has counteracted ſo much of its weight. The thread was ſtrained with a force equal to 3¾ pounds, or ¾ths of 5 pounds. In like manner, the three pound weight would have fallen 16 feet; but it was raiſed 4 feet. Here was a change preciſely equal to the other. A force of 3¾ pounds, acting on a maſs whoſe matter is only 3, will, in a ſecond, cauſe it to deſcribe 20 feet with a uniformly accelerated motion. Now, 5 × 12, and 3 × 20, give the ſame product 60. And thus we ſee, that the quantity of motion extinguiſhed or produced, and not the product of the weight and height, is the true unequivocal meaſure of mechanical power really expended, or the mechanical effect really produced; and that theſe two are always equal and oppoſite. At the ſame time, Mr Smeaton's theorem merits the attention of engineers; becauſe it generally meaſures the opportunities that we have for procuring the exertion of power. In ſome ſenſe Mr Smeaton may ſay, that the quantity of water multiplied by the height from which it deſcends in working our machines, is the meaſure of the power expended; becauſe we muſt raiſe this quantity to the dam again, in order to have the ſame uſe of it. It is expended, but not employed; for the water, at leaving the wheel, is ſtill able to do ſomething.

24.

It requires but little conſideration to be ſenſible, that the preceding account of the ceſſation of accelerated motion in our principal machines, muſt introduce different maxims of conſtruction from thoſe which were expreſsly adapted to this acceleration; or rather, which proceeded on the erroneous ſuppoſition of the conſtancy of the impelling power and the reſiſtance. The examination of this point has brought into view the fundamental principle of working machines, namely, the perfect equilibrium which takes place between the impelling power and the ſimultaneous reſiſtance. It may be expreſſed thus:

Firſt principle of working machines.

The force required for preſerving a machine in uniform motion, with any velocity whatever, is that which is neceſſary for balancing the reſiſtance then actually exerted on the working point of the machine. We ſaw this diſtinctly in the inſtance of the two weights acting againſt each other by the intervention of a thread over a fixed pulley. It is equally true of every caſe of acting machinery: for if the force at the impelled point be greater than what balances the reſiſtance acting at the ſame point, it muſt accelerate that point, and therefore accelerate the whole machine; and if the impelling force be leſs than this, the machine muſt immediately retard in its motion. When the machine has once acquired this degree of motion, every part of it will continue in its preſent ſtate of motion, if only the two external forces are in equilibrio, but not otherwiſe. But when the preſſure of the external power on the impelled point balances the reſiſtance oppoſed by that point, it is, in fact, maintaining the equilibrium with the external power acting at the working point; for this is the only way that external forces can be ſet in oppoſition to each other by the intervention of a body. The external forces are not in immediate equilibrio with each other, but each is in equilibrio with the force exerted by the point on which it acts. This force exerted by the point is a modification of the connecting forces of the body, all of which are brought into action by means of the actions of the external forces, and each is accompanied by a force preciſely equal and oppoſite to it. Now, the principles of ſtatics teach us the proportions of the external preſſures which are thus ſet in equilibrium by the intervention of a body; and therefore teach us what proportion of power and reſiſtance will keep a machine of a given conſtruction in a ſtate of uniform motion.

This propoſition appears paradoxical, and contrary to common obſervation; for we find, that, in order to make a mill go faſter, we muſt either diminiſh the reſiſtance, or we muſt employ more men, or more water, or water moving with greater velocity, &c. But this ariſes from ſome of the cauſes already mentioned. Either the reſiſtance of the work is greater when the machine is made to move faſter, or the impulſion of the power is diminiſhed, or both theſe changes obtain. Friction and reſiſtance of air alſo come in for their ſhare, &c. The actual preſſure of a given quantity of the external power is diminiſhed, and therefore more of it muſt be employed. When a weight is *uniformly* raiſed by a machine, the preſſure exerted on it by the working point is preciſely equal to its weight, whatever be the velocity with which it riſes. But, even in this ſimpleſt caſe more natural power muſt be expended in order to raiſe it faſter; becauſe either more natural power muſt be employed to accelerate the external matter which is to preſs forward the impelled point, or the relative motion of the preſſing matter will be diminiſhed.

It is well known, that, in the employment of the mechanic powers, whether in their ſtate of greateſt ſimplicity, or any how combined in a complicated machine, if the machine be put in motion, the velocities of the extreme points (which we have called the *impelled* and *working* points) are inverſely proportional to the forces which are in equilibrio when applied to theſe points in the direction of their motion. This is an inductive propoſition, and has been uſed as the foundation of ſyſtems of mechanics. It is unneceſſary to take up time in proving what is ſo familiarly known; conſequently, the products of the preſſures at thoſe points by the velocities of the motions are equal; that is, the product of the preſſure actually exerted at the impelled point of a machine working uniformly, multiplied by the velocity of that point, is equal to the product of the reſiſtance actually exerted at the working point, multiplied by the velocity of that point, that is, by the velocity with which the reſiſtance is overcome,

$$pm = rn.$$

Now, the product of the reſiſtance, by the velocity with which it is overcome, is evidently the meaſure of the performance of the machine, or the work done. The product of the actual preſſure on the impelled point, by the velocity of that point, may be called the MOMENTUM OF IMPULSE.

Hence we deduce this propoſition.:

25 Second principle. Momentum of impulſe and the performance of the machine are equal.

In all working machines which have acquired a uniform motion, the performance of the machine is equal to the momentum of impulſe (A).

This is a propoſition of the utmoſt importance in the ſcience of machines, and leads to the fundamental maxim of their conſtruction. Since the performance of a machine is equal to the momentum of impulſe, it increaſes and diminiſhes along with it, and is a maximum when the momentum of impulſe is a maximum; therefore, the fundamental maxim in the conſtruction of a machine is to faſhion it in ſuch a manner, that the momentum of impulſe ſhall be a maximum, or that the product of the preſſure actually exerted on the impelled point of the machine by the velocity with which it moves may be as great as poſſible. Then are we certain that the product of the reſiſtance, by the velocity of the working point, is as great as poſſible, provided that we take care that none of the impulſe be needleſsly waſted by the way by injudicious communications of motion, by friction, by unbalanced loads, and by reciprocal motions, which irrecoverably waſte the impelling power. This maxim holds good, whether the reſiſtance remains conſtantly the ſame, or varies by any law whatever.

26 Important deſiderata for practice.

But much remains to be done for the improvement of mechanical ſcience before we can avail ourſelves of this maxim, and apply it with ſucceſs. The chief thing, and to this we ſhould give the moſt unremitting attention, is, to learn the changes which obtain in the actual preſſure exerted by thoſe natural powers which we can command; the changes of actual preſſure produced by a change of the velocity of the impelled point of the machine. Theſe depend on the ſpecific natures of thoſe powers, and are different in almoſt every different caſe. Nothing will more contribute to the improvement of practical mechanics than a ſeries of experiments, well contrived, and accurately made, for diſcovering thoſe laws of variation, in the caſes of thoſe powers which are moſt frequently employed. Such experiments, however, would be coſtly, beyond the abilities of an individual; therefore, it were greatly to be wiſhed that public aid were given to ſome perſons of ſkill in the ſcience to inſtitute a regular train of experiments of this kind. An experimental machine might be conſtructed, to be wrought either by men or by cattle. This ſhould be loaded with ſome kind of work which can be very accurately meaſured, and the load varied at pleaſure. When loaded to a certain degree, the men or cattle ſhould be made to work at the rate which they can continue from day to day. The number of turns made in an hour, multiplied by the load, will give the performance correſponding to the velocities; and thus will be diſcovered the moſt advantageous rate of motion. The ſame machine ſhould alſo be fitted for grinding, for ſawing, boring, &c. and ſimilar experiments will diſcover the relation between the velocities with which theſe operations are performed, and the reſiſtances which they exert. The laws of friction may be inveſtigated by the ſame machine. It ſhould alſo be fitted with a walking wheel, and the trial ſhould be made of the ſlope and the velocity of walking which gives the greateſt momentum of impulſe. It is not unreaſonable to expect great advantages from ſuch a train of experiments.

27 A ſubſtitute for them.

Till this be done, we muſt content ourſelves with eſtabliſhing the above, in the moſt general terms, applicable to any caſe in which the law of the variation of force may hereafter be diſcovered.

There is a certain velocity of the impelled point of a machine which puts an end to the action of the moving power. Thus, if the floats of an underſhot wheel be moving with the velocity of the ſtream, no impulſe is made on them. If the arm of a gin or capſtan be moving with that velocity with which a horſe or a man can juſt move, ſo as to continue at that ſpeed from day to day, employing all his working ſtrength, but not fatiguing himſelf; in this ſtate of motion, the animal can exert no preſſure on the machine. This may be called the EXTINGUISHING VELOCITY, and we may expreſs it by the ſymbol e. Let f be that degree of force or preſſure which the animal can exert at a dead pull or thruſt, as it is called. We do not mean the utmoſt ſtrain of which the animal is capable, but that which it can continue unremittingly during the working hours of a day, fully employing, but not fatiguing itſelf. And let p be the preſſure which it actually exerts on the impelled point of a machine, moving with the velocity m.

(A) The truth of this propoſition has been long perceived in every particular inſtance that happened to engage the attention; but we do not recollect any mechanician before Mr Euler conſidering it as a general truth, expreſſing in a few words a mechanical law. This celebrated mathematician undertook, about the year 1735 or 1736, a general and ſyſtematic view of machines, in order to found a complete theory immediately conducive to the improvement of practical mechanics. In 1743 he publiſhed the firſt propoſitions of this uſeful theory in the 10th volume of the *Comment. Petropolitani*, containing the excellent dynamical theorems of which we have given the ſubſtance. In the 3d volume of the *Comment. Novi Petropol.* he proſecuted the ſubject a little farther; and in the 8th volume, he entered on what we are now engaged in, and formally announces this fundamental propoſition, calling theſe two products the *momentum of impulſe*, and the *momentum of effect*. It is much to be regretted, that this conſummate mathematician did not continue theſe uſeful labours; his ardent mind being carried away by more abſtruſe ſpeculations in all the moſt refined departments of mathematics and philoſophy. No man in Europe could have proſecuted the ſubject with more judgment and ſucceſs.—See alſo *Mem. Acad. Berlin*, 1747 and 1752.

Let $e-m$ be called the RELATIVE VELOCITY, and let it be expreſſed by v. And let it be ſuppoſed, that it has been diſcovered, by any means whatever, that the actual preſſure varies in the proportion of v^q, or $\overline{e-m}^q$. This ſuppoſition gives us $e^q : v^q = f : p$, and $p = f \times \frac{v^q}{e^q}$. For the machine muſt be at reſt, in order that the agent may be able to exert the force f on its impelled point. But when the machine is at reſt, what we have named the relative velocity is e, the whole of the extinguiſhing velocity.

The momentum of impulſe is $p\ m$, that is $\frac{v^q}{e_q} f m$, or $f \times \frac{v^q}{e^q} \times \overline{e-v}$ (becauſe $m = e - v$). Therefore $f \times \frac{v^q}{e^q} \times \overline{e-v}$ muſt be made a maximum. But f and e^q are two quantities which ſuffer no change. Therefore the momentum of impulſe will be a maximum when $v_q \times \overline{e-v}$ is a maximum. Now $v^q \times \overline{e-v} = v^q\, e - v^q\, v, = v^q\, e - v^{q+1}$. The fluxion of this is $q e v^{q-1} \dot{v} - \overline{q+1}\, v^q \dot{v}$. This being ſuppoſed $= e$, we have the equatation

$$q\, e\, v^{q-1} = \overline{q+1}\, v^q$$

$$\text{And } q\, e = \overline{q+1}\, v$$

$$\text{Therefore } v = \frac{q\ e}{q+1}$$

And m, which is $= e - v$, becomes $\frac{e}{q+1}$. Therefore we muſt order matters ſo, that the velocity of the impelled point of the machine may be $= \frac{e}{q+1}$. Now p is $= f \frac{v^q}{e^q}$, and therefore $= f \times \frac{q^q}{\overline{q+1}^q}$. And $p\ m$, $= f \frac{q^q}{\overline{q+1}^q} m, = f \frac{q^q}{\overline{q+1}^q} \times \frac{e}{q+1}, = f \times \frac{q^q\, e}{\overline{q+1}^{q+1}}, =$ the momentum of impulſe, and therefore = the momentum of effect, or the performance of the machine, when in its beſt ſtate.

28
Example in underſhot mills by Mr Parent

Thus may the maxim of conſtruction be ſaid to be brought to a ſtate of great ſimplicity, and of moſt eaſy recollection. A particular caſe of this maxim has been long known, having been pointed out by Mr Parent. Since the action of bodies depends on their relative velocity, the impulſe of fluids muſt be as the ſquare of the relative velocity. From which Mr Parent deduced, that the moſt advantageous velocity of the floats of an underſhot wheel is one-third of that of the ſtream. This maxim is evidently included in our general propoſition; for in this caſe, the index q of that function of the relative velocity v, which is proportional to the impulſe, is $= 2$. Therefore we have the maximum when $v = \frac{2e}{2+1}, = \frac{2}{3} e$, and $m = \frac{1}{3} e$. e, the extinguiſhing velocity, is evidently the velocity of the ſtream. Our propoſition alſo gives us the preciſe value of the performance. The impulſe of the ſtream on the float at reſt being ſuppoſed $= f$, its impulſe on the float moving with the velocity $\frac{2}{3} e$ muſt be $= \frac{4}{9} f$. This is the meaſure of the actual preſſure p. This being multiplied by m, or by $\frac{1}{3} e$, gives $\frac{4}{27} f$. Now f is conſidered as equal to the weight of a column of water, having the ſurface of the floatboard for its baſe, and the depth of the ſluice under the ſurface of the reſervoir (or, more accurately, the fall required for generating the velocity of the ſtream) for its height. Hence it has been concluded, that the utmoſt performance of an underſhot wheel is to raiſe $\frac{4}{27}$ of the water which impels it, to the height from which it falls. But this is not found very agreeable to obſervation. Friction, and many imperfections of execution in the delivery of the water, the direction of its impulſe, &c. may be expected to make a defalcation from this theoretical performance. But the actual performance, even of mills of acknowledged imperfection, conſiderably exceeds this, and ſometimes is found nearly double of this quantity. The truth is, that the particular fact from which Mr Parent firſt deduced this maxim (namely, the performance of what is called *Parent's* or *Dr Barker's mill*), is, perhaps of all that could have been ſelected, the leaſt calculated for being the foundation of a general rule, being of a nature ſo abſtruſe, that the firſt mathematicians of Europe are to this day doubtful whether they have a juſt conception of its principles. Mr Smeaton's experiments ſhew very diſtinctly, that the maximum of performance of an underſhot wheel correſponds to a velocity conſiderably greater than one-third of the ſtream, and approaches nearly to one-half; and he aſſigns ſome reaſons for this which ſeem well founded. But, independent of this, the performance of Mr Smeaton's model was much greater than what correſponds with the velocity by the above mentioned eſtimation of f. The theory of the impulſion of fluids is extremely imperfect; and Daniel Bernoulli ſhews, from very unqueſtionable principles, that the impulſe of a narrow vein of fluid on an extended ſurface is double of what was generally ſuppoſed; and his concluſions are abundantly confirmed by the experiments adduced by him.

Not accurate.

29
This ſubſtitute is uſeful, even where it is not altogether exact.

It is by no means pretended, that the maxim of conſtruction is reduced to the great ſimplicity enounced in the propoſition now under conſideration. We only ſuppoſed, that a caſe had been obſerved where the preſſure exerted by ſome natural agent did follow the proportions of v^q. This being admitted, the propoſition is ſtrictly true. But we do not know any ſuch caſe; yet is the propoſition of conſiderable uſe: for we can affirm, on the authority of our own obſervations, that the action both of men and of draught horſes does not deviate very far from the proportions of v^2. The obſervations were made on men and horſes tracking a lighter along a canal, and working ſeveral days together, without having any knowledge of the purpoſe of the obſervations. The force exerted was firſt meaſured by the curvature and weight of the track rope, and afterwards by a ſpring ſteelyard. This was multiplied by the number of yards per hour, and the product conſidered as the momentum. We found the action of men to be very nearly as $\overline{e-m}^2$. The action of horſes, loaded ſo as not to be able to trot, was nearly as $\overline{e-m}^{1,7}$,

The practitioner can eaſily avail himſelf of the maxim, although the function q ſhould never be reduced to any algebraic form. He has only to inſtitute a train of experiments on the natural agent, and ſelect that velocity which gives the higheſt product when multiplied by its correſponding preſſure.

30
Two methods of availing ourſelves of this maximum.

When this ſelection has been made, we have two ways of giving our working machines the maximum of effect, having once aſcertained the preſſure f which our natural power exerts on the impelled point of the machine when it is not allowed to move.

1. When the reſiſtance ariſing from the work, and from friction, is a given quantity; as when water is to be raiſed to a certain height by a piſton of given dimenſions.

Since the friction in all the communicating parts of the machine vary in the ſame proportion with the preſſure, and ſince theſe vary in the ſame proportion with the reſiſtance, the ſum of the reſiſtance and friction may be repreſented by $b\,r$, b being an abſtract number. Let n be the undetermined velocity of the working point; or let $m:n$ be the proportion of velocities at the impelled and working points. Then, becauſe the preſſures at theſe points balance each other, in the caſe of uniform motion, they are inverſely as the velocities at thoſe points. Therefore we muſt make $b\,r : p = m : n$,

and $n = \frac{p\,m}{b\,r}, = \frac{\frac{q^q}{\overline{q+1}^q} f\,m}{b\,r}, = m\,\frac{q^q f}{\overline{q+1}^q\, b\,r}$, or $m : n = \overline{q+1}^q \times b\,r : q^q f$.

2. On the other hand, when $m:n$ is already given, by the conſtruction of the machine, but $b\,r$ is ſuſceptible of variation, we muſt load the machine with more and more work, till we have reduced the velocity of its impelled point to $\frac{e}{q+1}$.

In either caſe, the performance is expreſſed by what expreſſes $p\,m$, that is, by $f\,e \times \frac{q^q}{\overline{q+1}^{q+1}}$. But the uſeful performance, which is really the work done, will be had by dividing the value now obtained by the number b, which expreſſes the ſum of the reſiſtance overcome by the working point and the friction of the machine.

Recapitulation.

What has been now delivered contains, we imagine, the chief principles of the theory of machines, and points out the way in which we muſt proceed in applying them to every caſe. The reader, we hope, ſees clearly the imperfection of a conſideration of machines which proceeds no farther than the ſtatement of the proportions of the ſimultaneous preſſures which are excited in all the parts of the machine by the application of the external forces, which we are accuſtomed to call the *power* and the *weight*. Unleſs we take alſo into conſideration, the immediate effect of mechanical force applied to body, and combine this with all the preſſures which ſtatical principles have enabled us to aſcertain, and by this combination be able to ſay what portion of unbalanced force there is acting at one and all of the preſſing points of the machine, and what will be the motion of *every part* of it in conſequence of this overplus, we have acquired no knowledge that can be of ſervice to us. We have been contemplating, not a working machine, but a ſort of balance. But, by reaſoning about theſe unbalanced forces in the ſame ſimple manner as about the fall of heavy bodies, we were able to diſcover the momentary accelerations of every part, and the ſenſible motion which it would acquire in any aſſigned time, if all the circumſtances remain the ſame. We found that the reſults, although deduced from unqueſtionable principles, were quite unlike the obſerved motions of moſt working machines. Proceeding ſtill on the ſame principles, we conſidered this deviation as the indication, and the preciſe meaſure, of ſomething which we had not yet attended to, but which the deviation brought into view, and enabled us to aſcertain with accuracy. Theſe are the changes which happen in the exertions of our actuating powers by the velocity with which we find it convenient to make them act. Thus we learn more of the nature of thoſe powers; and we found it neceſſary to diſtinguiſh carefully between the apparent magnitude of our actuating power and its real exertion in doing our work. This conſideration led us to a fundamental propoſition concerning all working machines when they have attained an uniform motion; namely, that the power and reſiſtance then really exerted on the machine preciſely balance each other, and that the machine is preciſely in the condition of a ſteelyard loaded with its balanced weights, and moved round its axis by ſome external force diſtinct from the power and the weight. We found that this force is the previous overplus of impelling power, before the machine had acquired the uniform motion; and on this occaſion we learned to eſtimate the effect produced, by the momentum (depending on the form of the machine) of the quantity of motion produced in the whole aſſemblage of power, reſiſtance, and machine.

31
Theory of machines ſtill intricate, eſpecially of ſuch as reciprocate.

The theory of machines ſeemed to be now brought back to that ſimplicity of equilibrium which we had ſaid was ſo imperfect a foundation for a theory; but in the availing ourſelves of the maxim founded on this general propoſition, we ſaw that the equilibrium is of a very different kind from a quieſcent equilibrium. It neceſſarily involves in it the knowledge of the momentary accelerations and their momenta; without which we ſhould not perceive that one ſtate of motion is more advantageous than another, becauſe all give us the ſame proportion of forces in equilibrio.

But this is not the only uſe of the previous knowledge of the momentary accelerations of machines; there are many caſes where the machine works in this very ſtate. Many machines accelerate throughout while performing their work; and their efficacy depends entirely on the final acceleration. Of this kind is the coining preſs, the great forge or tilt mill, and ſome other capital engines. The ſteam engine, and the common pump, are neceſſarily of this claſs, although their efficacy is not eſtimated by their final acceleration. A great number of engines have reciprocating motions in different ſubordinate parts. The theory of all ſuch engines requires for its perfection an accurate knowledge of the momentary accelerations; and we muſt uſe the formulæ contained in the firſt part of this article.

32
Working and returning ſtrokes.

Still, however, the application of this knowledge has many difficulties, which make a *good* theory of ſuch machines a much more intricate and complicated matter than we have yet led the reader to ſuppoſe. In moſt of theſe engines, the whole motion may be divided into two parts. One may be called the WORKING STROKE, and the other in which the working points are brought back to a ſituation which fits them for acting again, may be called the RETURNING STROKE. This return muſt be effected either by means of ſome immediate application of the actuating power, or by ſome other force, which is counteracted during the working ſtroke, and muſt be conſidered as making part of the reſiſtance. In the ſteam engine, it is generally done by a counterpoiſe on the outer end of the great working beam. This muſt be accounted a part of the reſiſtance, for it muſt be raiſed again; and the proportions of the machine for attaining the maximum muſt be computed accordingly. The quantity of this counterpoiſe muſt be adjuſted by other conſiderations. It muſt be ſuch, that the deſcent of the pump rods in the pit may *juſt employ the whole time* that is neceſſary for filling the cylinder with ſteam. If they deſcend more briſkly (which an unſkilful engineer likes to ſee), this muſt be done by means of a greater counterpoiſe, and this employs more power to raiſe it again. Deſaguliers deſcribes a very excellent machine for raiſing water in a bucket by a man's ſtepping into an oppoſite bucket, and deſcending by his preponderancy. When he comes to the bottom, he ſteps out, goes up a ſtair, and finds the bucket returned and ready to receive him again. This machine is extremely ſimple, and perhaps the beſt that can be contrived; and yet it is one of the moſt likely to be a very bad one. The bucket into which the man ſteps muſt be brought up to its place again by a preponderancy in the machine when unloaded. It may be returned ſooner or later. It ſhould arrive preciſely at the ſame time with the man. If ſooner, it is of no uſe, and waſtes power in raiſing a counterpoiſe which is needleſsly heavy; if later, time is loſt: Therefore, the perfection of this very ſimple machine requires the judicious combination of two maximums, each of which varies in a ratio compounded of two other ratios. Suppoſe the man to employ a minute to go up ſtairs 50 feet, which is very nearly what he can do from day to day as his only work, and ſuppoſe him to weigh 150 pounds, and that he acts by means of a ſimple pulley—the maximum for a lever of equal arms would require him to raiſe about 60 pounds of water. But when all the other circumſtances are calculated, it will be found that he muſt raiſe 138 pounds (neglecting the inertia of the machine). He ſhould raiſe 542 pounds 10 feet in a minute; and this is nearly the moſt exact valuation of a man's work.

There is the ſame neceſſity of attending to a variety of circumſtances in all machines which reciprocate in the whole or any conſiderable part of their motion. The force employed for bringing the machine into another working poſition, muſt be regulated by the time neceſſary for obtaining a new ſupply of power; and then the proportion of m to n muſt be ſo adjuſted, that the work performed, divided by the *whole* time of the working and returning ſtrokes, may give the greateſt quotient. It is ſtill a difficult thing, therefore, to conſtruct a machine in the moſt perfect manner, or even to ſay what will be the performance of a machine already conſtructed; yet we ſee that every circumſtance is ſuſceptible of accurate computation.

With reſpect to machines which acquire a ſort of uniform motion in general, although ſubject to partial reciprocations, as in a pumping, ſtamping, forging engine, it is alſo difficult to aſſign the rate even of this general uniform motion. We may, however, ſay, that it will not be greater than if it were uniform throughout. Were it entirely free from friction, it would be exactly the ſame as if uniform; becauſe the accelerations during the advantageous ſituations of the impelling power would compenſate the retardations. But friction diminiſhes the accelerations, without diminiſhing the retardations.

We may conclude this article with ſome obſervations tending to the general improvement of machines.

33
Uniformity of motion throughout is of great advantage.

Nothing contributes more to the perfection of a machine, eſpecially ſuch as is maſſive and ponderous, than great uniformity of motion. Every irregularity of motion waſtes ſome of the impelling power; and it is only the greateſt of the varying velocities which is equal to that which the machine would acquire if moving uniformly throughout; for while the motion accelerates, the impelling force is greater than what balances the reſiſtance then actually oppoſed to it, and the velocity is leſs than what the machine would acquire if moving uniformly: and when the machine attains its greateſt velocity, it attains it becauſe the power is then not acting againſt the whole reſiſtance. In both of theſe ſituations, therefore, the performance of the machine is leſs than if the power and reſiſtance were exactly balanced; in which caſe it would move uniformly.

34
How to attain this.

Every attention ſhould therefore be given to this, and we ſhould endeavour to remove all cauſe of irregularity. The communications of motion ſhould be ſo contrived, that if the impelled point be moving uniformly, by the uniform preſſure of the power, the working point ſhall alſo be moving uniformly. Then we may generally be certain, that the maſſy parts of the machine will be moving uniformly. When this is not done through the whole machine, there are continual returns of ſtrains and jolts: the inertia of the different parts acting in oppoſite directions. Although the whole momenta may always balance each other, yet the general motion is hobbling, and the points of ſupport are ſtrained. A great engine ſo conſtructed, commonly cauſes the building to tremble; but when uniform motion pervades the whole machine, the inertia of each part tends to preſerve this uniformity, and all goes ſmoothly. It is alſo deſerving of remark, that when the communications are ſo contrived that the uniform motion of one part produces uniform motion on the next, the preſſures at the communicating points remain conſtant or invariable. Now the accompliſhing of this is always within the reach of mechanics.

35
Beſt forms for the teeth of wheels.
Plate XXXIII. fig. 1.

One of the moſt uſual communications in machinery is by means of toothed wheels acting on each other. It is of importance to have the teeth ſo formed, that the preſſure by which one of them A urges the other B round its axis ſhall be conſtantly the ſame. It can eaſily be demonſtrated, that when this is the caſe, the uniform angular motion of the one will produce a uniform angular motion of the other; or, if the motions are thus uniform, the preſſures are invariable. This is accompliſhed on this principle, that the mutual actions of ſolid bodies on each other in the way of preſſure are perpendicular to the touching ſurfaces. Therefore let the tooth a preſs on the tooth b in the point C; and draw the line FCDE perpendicular to the touching ſurfaces in the point C. Draw AF, BE perpendicular to FE, and let FE cut the line AB in D. It is plain, from the common principles of mechanics, that if the line FE, drawn in the manner now deſcribed, always paſs through the ſame point D, whatever may be the ſituation of the acting teeth, the mutual action of the wheels will always be the ſame. It will be the ſame as if the arm AD acted on the arm BD. In the treatiſes on the conſtruction of mills, and other works of this kind, are many inſtructions for the formation of the teeth of wheels; and almoſt every noted millwright has his own noſtrums. Moſt of them are egregiouſly faulty in reſpect of mechanical principle. Indeed they are little elſe than inſtructions how to make the teeth clear each other without ſticking. Mr de la Hire firſt pointed out the above mentioned principle, and juſtly condemned the common practice of making the ſmall wheel or pinion in the form of a lantern (whence it alſo took its name), conſiſting of two round diſks, having a number of cylindrical ſpokes (fig. 2.). The ſlighteſt inſpection of this conſtruction ſhews, that, in the different ſituations of the working teeth, the line FCE continually changes its interſection with AB. If the wheel B be very ſmall in compariſon of the other, and if the teeth of A take deep hold of the cylindrical pins of B, the line of action EF is ſometimes ſo diſadvantageouſly placed, that the preſſure of the one wheel has ſcarcely any tendency at all to turn the other. Mr de la Hire, or Dr Hooke, was, we think, the firſt who inveſtigated the form of tooth which procured this conſtant action between the wheels; and in a very ingenious diſſertation, publiſhed among the Memoirs of the Academy of Sciences at Paris 1668, the former of theſe gentlemen ſhews, that this will be enſured by forming the teeth into epicycloids. Mr Camus of the ſame Academy has publiſhed an elaborate diſſertation on the ſame ſubject, in which he proſecutes the principle of Mr de la Hire, and applies it to all the variety of caſes which can occur in practice. There is no doubt as to the goodneſs of the principle; and it has another excellent property, "that the mutual action of the teeth is abſolutely without any friction." The one tooth only applies itſelf to the other, and rolls on it, but does not ſlide or rub in the ſmalleſt degree. This makes them laſt long, or rather does not allow them to wear in the leaſt. But the conſtruction is ſubject to a limitation which muſt not be neglected. The teeth muſt be ſo made, that the curved part of the tooth *b* is acted on by a flat part of the tooth *a* till it comes to the line AB in the courſe of its action; after which the curved part of *a* acts on a flat part of *b*; or the whole action of *a* on *b* is either completed, or only begins at the line AB, joining the centres of the wheels.

Epicycloids recommended by De la Hire.

36
A better form.

Another form of the teeth ſecures the perfect uniformity of action without this limitation, which requires very nice execution. Let the teeth of each wheel be formed by evolving its circumference; that is, let the acting face GCH of the tooth *a* have the form of the curve traced by the extremity of the thread FC, unlapped from the circumference. In like manner, let the acting face of the tooth *b* be formed by unlapping a thread from its circumference. It is evident, that the line FCE, which is drawn perpendicularly to the touching ſurfaces in the point C, is juſt the direction or poſition of the evolving threads by which the two acting faces are formed. This line muſt therefore be the common tangent to the two circles or circumferences of the wheels, and will therefore always cut the line AB in the ſame point D. This form allows the teeth to act on each other through the whole extent of the line FCE, and therefore will admit of ſeveral teeth to be acting at the ſame time (twice the number that can be admitted in Mr de la Hire's method). This, by dividing the preſſure among ſeveral teeth, diminiſhes its quantity on any one of them, and therefore diminiſhes the dents or impreſſions which they unavoidably make on each other. It is not altogether free from ſliding and friction, but the whole of it can hardly be ſaid to be ſenſible. The whole ſlide of a tooth three inches long, belonging to a wheel of ten feet diameter, acting on a tooth of a wheel of two feet diameter, does not amount to $\frac{1}{60}$th of an inch, a quantity altogether inſignificant.

In the formation of the teeth of wheels, a ſmall deviation from theſe perfect forms is not perhaps of very great importance, except in caſes where a very large wheel drives a very ſmall one (a thing which a good engineer will always avoid). As the conſtruction, however, is exceedingly eaſy, it would be unpardonable to omit it. Well formed teeth, and a great number of them acting at once, make the communication of motion extremely ſmooth and uniform. The machine works without noiſe, and the teeth laſt a very long time without ſenſibly changing their ſhape. But there are caſes, ſuch as the pallets of clocks and watches, where the utmoſt accuracy of form is of the greateſt importance for the perfection of the work.

37
Maxim for the conſtruction of ſtampers, &c.

When heavy ſtampers are to be raiſed, in order to drop on the matters to be pounded, the wipers by which they are lifted ſhould be made of ſuch a form, that the ſtamper may be raiſed by a uniform preſſure, or with a motion almoſt perfectly uniform. If this is not attended to, and the wiper is only a pin ſticking out from the axis, the ſtamper is forced into motion at once. This occaſions violent jolts to the machine, and great ſtrains on its moving parts and their points of ſupport; whereas when they are gradually lifted, the inequality of deſultory motion is never felt at the impelled point of the machine. We have ſeen piſtons moved by means of a double rack on the piſton rod. A half wheel takes hold of one rack, and raiſes it to the required height. The moment the half wheel has quitted that ſide of the rack, it lays hold of the other ſide, and forces the piſton down again. This is propoſed as a great improvement; correcting the unequable motion of the piſton moved in the common way by a crank. But it is far inferior to the crank motion. It occaſions ſuch abrupt changes of motion, that the machine is ſhaken by jolts. Indeed if the movement were accurately executed, the machine would be ſhaken to pieces, if the parts did not give way by bending and yielding. Accordingly, we have always obſerved that this motion ſoon failed, and was changed for one that was more ſmooth. A judicious engineer will avoid all ſuch ſudden changes of motion, eſpecially in any ponderous part of a machine.

When ſeveral ſtampers, piſtons, or other reciprocal movers, are to be raiſed and depreſſed, common ſenſe teaches us to diſtribute their times of action in a uniform manner, ſo that the machine may always be equally loaded with work. When this is done, and the obſervations in the preceding paragraph attended to, the machine may be made to move almoſt as ſmoothly as if there were no reciprocations in it. Nothing ſhews the ingenuity of the author more than the artful yet ſimple and effectual contrivances for obviating thoſe difficulties that unavoidably ariſe from the very nature of the work that muſt be performed by the machine, and of the power employed. The inventive genius and ſound judgment of Watt and Boulton are as perceptible to a ſkilled obſerver in theſe ſubordinate parts of ſome of their great engines, as in the original diſcovery on which their patent is founded. In ſome of thoſe engines the maſs of dead matter which muſt be put into motion, and this motion deſtroyed and again reſtored in every ſtroke, is enormous, amounting to above an hundred tons. The ingenious authors have even contrived to draw ſome advantages from it, by allowing a great want of equilibrium in certain poſitions; and this has been condemned as a blunder by engineers who did not ſee the uſe made of it.

38
The unavoidable inequalities of moving power muſt be compenſated by the conſtruction.

There is alſo great room for ingenuity and good choice in the management of the moving power, when it is ſuch as cannot immediately produce the kind of motion required for effecting the purpoſe. We mentioned the converſion of the continued rotation of an axis into the reciprocating motion of a piſton, and the improvement which was thought to have been made on the common and obvious contrivance of a crank, by ſubſtituting a double rack on the piſton-rod, and the inconvenience ariſing from the jolts occaſioned by this change. We have ſeen a great forge, where the engineer, in order to avoid the ſame inconvenience ariſing from the abrupt motion given to the great ſledge hammer of ſeven hundred weight, reſiſting with a five-fold momentum, formed the wipers into ſpirals, which communicated motion to the hammer almoſt without any jolt whatever; but the reſult was, that the hammer roſe no higher than it had been raiſed in contact with the wiper, and then fell on the iron bloom with very little effect. The cauſe of its inefficiency was not gueſſed at; but it was removed, and wipers of the common form were put in place of the ſpirals. In this operation, the rapid motion of the hammer is abſolutely neceſſary. It is not enough to *lift* it up; it muſt be *toſſed* up, ſo as to fly higher than the wiper lifts it, and to ſtrike with great force the ſtrong oaken ſpring which is placed in its way. It compreſſes this ſpring, and is reflected by it with a conſiderable velocity, ſo as to hit the iron as if it had fallen from a great height. Had it been allowed to fly to that height, it would have fallen upon the iron with ſomewhat more force (becauſe no oaken ſpring is perfectly elaſtic); but this would have required more than twice the time.

38
Great inconveniences of a reciprocating power.

In employing a power which of neceſſity reciprocates, to drive machinery which requires a continuous motion (as in applying the ſteam engine to a cotton or a griſt mill), there alſo occur great difficulties. The neceſſity of reciprocation in the firſt mover waſtes much power; becauſe the inſtrument which communicates ſuch an enormous force muſt be extremely ſtrong, and be well ſupported. The impelling power is waſted in imparting, and afterwards deſtroying, a vaſt quantity of motion in the working beam. The ſkilful engineer will attend to this, and do his utmoſt to procure the neceſſary ſtrength of this firſt mover, without making it a vaſt load of inert matter. He will alſo remark, that all the ſtrains on it, and on its ſupports, are changing their directions in every ſtroke. This requires particular attention to the manner of ſupporting it. If we obſerve the ſteam engines which have been long erected, we ſee that they have uniformly ſhaken the building to pieces. This has been owing to the ignorance or inattention of the engineer in this particular. They are much more judiciouſly erected now, experience having taught the moſt ignorant that no building can withſtand their deſultory and oppoſite jolts, and that the great movements muſt be ſupported by a frame work independent of the building of maſonry which contains it (B).

The engineer will alſo remark, that when a ſingle ſtroke ſteam engine is made to turn a mill, all the communications of motion change the direction of their preſſure twice every ſtroke. During the working ſtroke of the beam, one ſide of the teeth of the intervening wheels is preſſing the machinery forward; but during the returning ſtoke, the machinery, already in motion, is dragging the beam, and the wheels are acting with the other ſide of the teeth. This occaſions a rattling at every change, and makes it proper to faſhion both ſides of the teeth with the ſame care.

It will frequently conduce to the good performance of an engine, to make the action of the reſiſting work unequable, accommodated to the inequalities of the impelling power. This will produce a more uniform motion in machines in which the momentum of inertia is inconſiderable. There are ſome beautiful ſpecimens of this kind of adjuſtment in the mechaniſm of animal bodies.

39
Nature, operation, and uſe of a FLY.

It is very cuſtomary to add what is called a FLY to machines. This is a heavy diſk or hoop, or other maſs of matter *balanced on its axis*, and ſo connected with the machinery as to turn briſkly round with it. This may be done with the view of rendering the motion of the whole more regular, notwithſtanding unavoidable inequalities of the accelerating forces, or of the reſiſtances occaſioned by the work. It becomes a REGULATOR. Suppoſe the reſiſtance extremely unequal, and the impelling power perfectly conſtant; as when a bucket wheel is employed to work *one* pump. When the piſton has ended its working ſtroke, and while it is going down the barrel, the power of the wheel being ſcarcely oppoſed, it accelerates the whole machine, and the piſton arrives at the bottom of the barrel with a conſiderable velocity. But in the riſing again, the wheel is oppoſed by the column of water now preſſing on the piſton. This immediately retards the wheel; and when the piſton has reached the top of the barrel, all the acceleration is undone, and is to begin again. The motion

of

(B) The gudgeons of a water-wheel ſhould never reſt on the wall of the building. It ſhakes it; and if ſet up ſoon after the building has been erected, it prevents the mortar from taking firm bond; perhaps by ſhattering the calcareous cryſtals as they form. When the engineer is obliged to reſt the gudgeons in this way, they ſhould be ſupported by a block of oak laid a little hollow. This ſoftens all tremors, like the ſprings of a whee carriage. This practice would be very ſerviceable in many other parts of the conſtruction.

of ſuch a machine is very hobbling: but the ſuperplus of accelerating force at the beginning of a returning ſtroke will not make ſuch a change in the motion of the machine if we connect the fly with it. For the accelerating momentum is a determinate quantity. Therefore, if the radius of the fly be great, this momentum will be attained by communicating a ſmall angular motion to the machine. The momentum of the fly is as the ſquare of its radius; therefore it reſiſts acceleration in this proportion; and although the overplus of power generates the ſame momentum of rotation in the whole machine as before, it makes but a ſmall addition to its velocity. If the diameter of the fly be doubled, the augmentation of rotation will be reduced to one-fourth. Thus, by giving a rapid motion to a ſmall quantity of matter, the great acceleration during the returning ſtroke of the piſton is prevented. This acceleration continues, however, during the whole of the returning ſtroke, and at the end of it the machine has acquired its greateſt velocity. Now the working ſtroke begins, and the overplus of power is at an end. The machine accelerates no more; but if the power is juſt in equilibrio with the reſiſtance, it keeps the velocity which it has acquired, and is ſtill more accelerated during the *next* returning ſtroke. But now, at the beginning of the ſubſequent working ſtroke, there is an overplus of reſiſtance, and a retardation begins, and continues during the whole riſe of the piſton; but it is inconſiderable in compariſon of what it would have been without the fly; for the fly, retaining its acquired momentum, drags forward the reſt of the machine, aiding the impelling power of the wheel. It does this by all the communications taking into each other in the oppoſite direction. The teeth of the intervening wheels are heard to drop from their former contact on one ſide, to a contact on the other. By conſidering this proceſs with attention, we eaſily perceive that, in a few ſtrokes, the overplus of power during the returning ſtroke comes to be ſo adjuſted to the deficiency during the working ſtroke, that the accelerations and retardations exactly deſtroy each other, and every ſucceeding ſtroke is made with the ſame velocity, and an equal number of ſtrokes is made in every ſucceeding minute. Thus the machine acquires a general uniformity with periodical inequalities. It is plain, that by ſufficiently enlarging either the diameter or the weight of the fly, the irregularity of the motion may be rendered as ſmall as we pleaſe. It is much better to enlarge the diameter. This preſerves the friction more moderate, and the pivot wears leſs. For theſe reaſons, a fly is in general a conſiderable improvement in machinery, by equaliſing many exertions that are naturally very irregular. Thus, a man working at a common windlaſs, exerts a very irregular preſſure on the winch. In one of his poſitions in each turn he can exert a force of near 70 pounds without fatigue, but in another he cannot exert above 25; nor muſt he be loaded with much above this in general. But if a large fly be connected properly with the windlaſs, he will act with equal eaſe and ſpeed againſt 30 pounds.

40 It is a powerful regulator.

This regulating power of the fly is without bounds, and may be uſed to render uniform a motion produced by the moſt deſultory and irregular power. It is thus that the moſt regular motion is given to mills that are driven by a ſingle ſtroke ſteam engine, where for two or even three ſeconds there is no force preſſing round the mill. The communication is made through a maſſive fly of very great diameter, whirling with great rapidity. As ſoon as the impulſe ceaſes, the fly, continuing its motion, urges round the whole machinery with almoſt unabated ſpeed. At this inſtant all the teeth, and all the joints, between the fly and the firſt mover, are heard to catch in the oppoſite direction.

If any permanent change ſhould happen in the impelling power, or in the reſiſtance, the fly makes no obſtacle to its producing its full effect on the machine; and it will be obſerved to accelerate or retard uniformly, till a new general ſpeed is acquired exactly correſponding with this new power and reſiſtance.

Many machines include in their conſtruction movements which are equivalent with this intentional regulator. A flour mill, for example, cannot be better regulated than by its milſtone; but in the Albion mills, a heavy fly was added with great propriety; for if the mills had been regulated by their milſtones only, then at every change of ſtroke in the ſteam engine, the whole train of communications between the beam, which is the firſt mover, and the regulating milſtone, which is the very laſt mover, would take in the oppoſite direction. Although each drop in the teeth and joints be but a trifle, the whole, added together, would make a conſiderable jolt. This is avoided by a regulator immediately adjoining to the beam. This continually preſſes the working machinery in one direction. So judiciouſly were the movements of that noble machine contrived, and ſo nicely were they executed, that not the leaſt noiſe was heard, nor the ſlighteſt tremor felt in the building.

Mr Valoué's beautiful pile engine employed at Weſtminſter Bridge is another remarkable inſtance of the regulating power of a fly.* When the ram is dropped, and its follower diſengaged immediately after it, the horſes would inſtantly tumble down, becauſe the load, againſt which they had been ſtraining hard, is at once taken off; but the gin is connected with a very large fly, which checks any remarkable acceleration, allowing the horſes to lean on it during the deſcent of the load; after which their draught recommences immediately. The ſpindles, cards, and bobbins, of a cotton mill, are alſo a ſort of flies. Indeed all bulky machines of the rotative kind tend to preſerve their motion with ſome degree of ſteadineſs, and their great momentum of inertia is as uſeful in this reſpect as it is prejudicial to the acceleration or any reciprocation when wanted.

41 A bad conſtruction of a fly.

There is another kind of regulating fly, conſiſting of wings whirled briſkly round till the reſiſtance of the air prevents any great acceleration. This is a very bad one for a *working* machine, for it produces its effect by *really waſting* a part of the moving power. Frequently it employs a very great and unknown part of it, and robs the proprietor of much work. It ſhould never be introduced into any machine employed in manufactures.

42 A conical pendulum is the moſt perfect regulator.

Some rare caſes occur where a very different regulator is required; where a certain determined velocity is found neceſſary. In this caſe the machine is furniſhed, at its extreme mover, with a conical pendulum, conſiſting of two heavy balls hanging by rods, which move in very nice and ſteady joints at the top of a vertical axis. It is well known, that when this axis turns round, with an angular velocity ſuited to the length of thoſe pendulums,

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* See Pile-*Engine*, Encycl.

dulums, the time of a revolution is determined. Thus, if the length of each pendulum be 39⅕ inches, the axis will make a revolution in two ſeconds very nearly. If we attempt to force it more ſwiftly round, the balls will recede a little from the axis, but it employs as long time for a revolution as before; and we cannot make it turn ſwifter, unleſs the impelling power be increaſed beyond all probability; in which caſe the pendulum will fly out from the centre till the rods are horizontal, after which every increaſe of power will accelerate the machine very ſenſibly. Watt and Boulton have applied this contrivance with great ingenuity to their ſteam engines, when they are employed for driving machinery for manufactures which have a very changeable reſiſtance, and where a certain ſpeed cannot be much departed from without great inconvenience. They have connected this receſs of the balls from the axis (which gives immediate indication of an increaſe of power or a diminution of reſiſtance) with the cock which admits the ſteam to the working cylinder. The balls flying out, cauſe the cock to cloſe a little, and diminiſh the ſupply of ſteam. The impelling power diminiſhes the next moment, and the balls again approach the axis, and the rotation goes on as before, although there may have occurred a very great exceſs or deficiency of power. The ſame contrivance may be employed to raiſe or lower the feeding ſluice of a water mill employed to drive machinery.

43 A fly ſometimes collects power.

A fly is ſometimes employed for a very different purpoſe from that of a regulator of motion—it is employed as a *collector of power*. Suppoſe all reſiſtance removed from the working point of a machine furniſhed with a very large or heavy fly immediately connected with the working point. When a ſmall force is applied to the impelled point of this machine, motion will begin in the machine, and the fly begin to turn. Continue to preſs uniformly, and the machine will accelerate. This may be continued till the fly has acquired a very rapid motion. If at this moment a reſiſting body be applied to the working point, it will be acted on with very great force; for the fly has now accumulated in its circumference a very great momentum. If a body were expoſed immediately to the action of this circumference, it would be violently ſtruck. Much more will it be ſo, if the body be expoſed to the action of the working point, which perhaps makes one turn while the fly makes a hundred. It will exert a hundred times more force there (very nearly) than at its own circumference. All the motion which has been accumulated on the fly during the whole progreſs of its acceleration is exerted in an inſtant at the working point, multiplied by the momentum depending on the proportion of the parts of the machine. It is thus that the coining preſs performs its office; nay, it is thus that the blackſmith forges a bar of iron. Swinging the great ſledge hammer round his head, and urging it with force the whole way, this accumulated motion is at once extinguiſhed by impact on the iron. It is thus we drive a nail; and it is thus that by accumulating a very moderate force exerted during four or five turns of a fly, the whole of it is exerted on a punch ſet on a thick plate of iron, ſuch as is employed for the boilers of ſteam engines. The plate is pierced as if it were a bit of cheeſe. This accumulating power of a fly has occaſioned many who think themſelves engineers to imagine, that a fly really adds power or mechanical force to an engine; and, not underſtanding on what its efficacy depends, they often place the fly in a ſituation where it only added a uſeleſs burden to the machine. It ſhould always be made to move with rapidity. If intended for a mere regulator, it ſhould be near the firſt mover. If it is intended to accumulate force in the working point, it ſhould not be far ſeparated from it. In a certain ſenſe, a fly may be ſaid to add power to a machine, becauſe by accumulating into the exertion of one moment the exertions of many, we can ſometimes overcome an obſtacle that we never could have balanced by the ſame machine unaided by the fly.

It is this accumulation of force which gives ſuch an appearance of power to ſome of our firſt movers. When a man is unfortunately catched by the teeth of a paltry country mill, he is cruſhed almoſt to mummy. The power of the ſtream is conceived to be prodigious; and yet we are certain, upon examination, that it amounts to the preſſure of no more than fifty or ſixty pounds. But it has been acting for ſome time; and there is a milſtone of a ton weight whirling twice round in a ſecond. This is the force that cruſhed the unfortunate man; and it required it all to do it, for the mill ſtopped. We ſaw a mill in the neighbourhood of Elbingroda in Hanover, where there was a contrivance which diſengaged the milſtone when any thing got entangled in the teeth of the wheels. It was tried in our ſight with a head of cabbage. It cruſhed it indeed, but not violently, and would by no means have broken a man's arm.

44 Simplicity of conſtruction recommended.

It is hardly neceſſary to recommend ſimplicity in the conſtruction of machines. This ſeems now ſufficiently underſtood. Multiplicity of motions and communications increaſes frictions; increaſes the unavoidable loſſes by bending and yielding in every part; expoſes to all the imperfections of workmanſhip; and has a great chance of being indiſtinctly conceived, and therefore conſtructed without ſcience. We think the following conſtruction of a capſtan or crab a very good example of the advantages of ſimplicity. It is the invention of an untaught but very ingenious country tradeſman.

Fig. 3. 45 Example of a very ſimple and powerful capſtan.

EAB is the barrel of the capſtan, ſtanding vertically in a proper frame, as uſual, and urged round by bars ſuch as EF. The upper part A of the barrel is 17 inches in diameter, and the lower B is 16. C is a ſtrong pulley 16 inches in diameter, having a hook D, which takes hold of a hawſer attached to the load. The rope ACB is wound round the barrel A, paſſes over the pulley C, and is then wound round the barrel B in the oppoſite direction. No farther deſcription is neceſſary, we think, to ſhew that, by heaving by the bar F, ſo as to wind more of the rope upon A, and unwind it from B, the pulley C muſt be brought nearer to the capſtan by about three inches for each turn of the capſtan; and that this ſimple capſtan is equivalent to an ordinary capſtan of the ſame length of bar EF, and diameter of barrel B, combined with a 16 fold tackle of pulleys; or, in ſhort, that it is 16 times more powerful than the common capſtan; free from the great loſs by friction and bending of ropes, which would abſorb a third of the power of a 16 fold tackle; and that whereas all other engines become weaker as they multiply the power to a greater degree (unleſs they are proportionally more bulky), this engine becomes really ſtronger in itſelf. Suppoſe we wanted to have it twice as powerful as at preſent; nothing is neceſſary but to cover the part B of the barrel with laths a quarter of an inch thick. In ſhort, the nearer the two barrels are to equality, the more powerful does it become. We give it to the public as an excellent capſtan, and as ſuggeſting thoughts which an intelligent engineer may employ with great effect. By this contrivance, and uſing an iron wire inſtead of a catgut, we converted a common eight day clock into one which goes for two months.

We intended to conclude this article with ſome obſervations on the chief claſſes of powers which are employed to drive machinery; ſuch as water, wind, atmoſpheric preſſure, gunpowder, and the force of men and other animals, giving ſome notion of their abſolute magnitudes, and the effect which may be expected from them. We ſhould then have mentioned what has been diſcovered as to their variation by a variation of velocity. And we intended to conclude with an account of what knowledge has been acquired concerning fricton, and the loſs of power in machinery ariſing from this cauſe, and from the ſtiffneſs of ropes, and ſome other cauſes: But we have not yet been able to bring theſe matters into a connected form, which would ſuggeſt the methods and means of farther information thereon. We muſt endeavour to find another opportunity of communicating to the public what we may yet learn on thoſe ſubjects.

We have now eſtabliſhed the principles on which machines muſt be conſtructed, in order that they may produce the greateſt effect; but it would be improper to diſmiſs the ſubject without ſtating to our readers Mr Bramah's new method of producing and applying a more conſiderable degree of power to all kinds of machinery requiring motion and force, than by any means at preſent practiſed for that purpoſe. This method, for which on the 31ſt of March 1796 he obtained a patent, conſiſts in the application of water or other denſe fluids to various engines, ſo as, in ſome inſtances, to cauſe them to act with immenſe force; in others, to communicate the motion and powers of one part of a machine to ſome other part of the ſame machine; and, laſtly, to communicate the motion and force of one machine to another, where their local ſituations preclude the application of all other methods of connection.

The firſt and moſt material part of this invention will be clearly underſtood by an inſpection of fig. 4. where “ A is a cylinder of iron, or other materials, ſufficiently ſtrong, and bored perfectly ſmooth and cylindrical; into which is fitted the piſton B, which muſt be made perfectly water-tight, by leather or other materials, as uſed in pump-making. The bottom of the cylinder muſt alſo be made ſufficiently ſtrong with the other part of the ſurface, to be capable of reſiſting the greateſt force or ſtrain that may at any time be required. In the bottom of the cylinder is inſerted the end of the tube C; the aperture of which communicates with the inſide of the cylinder, under the piſton B, where it is ſhut with the ſmall valve D, the ſame as the ſuction pipe of a common pump. The other end of the tube C communicates with the ſmall forcing pump or injector E, by means of which water or other denſe fluids can be forced or injected into the cylinder A, under the piſton B. Now, ſuppoſe the diameter of the cylinder A to be 12 inches, and the diameter of the piſton of the ſmall pump or injector E only one quarter of an inch, the proportion between the two ſurfaces or ends of the ſaid piſtons will be as 1 to 2304; and ſuppoſing the intermediate ſpace between them to be filled with water or other denſe fluid capable of ſufficient reſiſtance, the force of one piſton will act on the other juſt in the above proportion, viz. as 1 is to 2304. Suppoſe the ſmall piſton in the injector to be forced down when in the act of pumping or injecting water into the cylinder A, with the power of 20 cwt. which could eaſily be done by the lever H; the piſton B would then be moved up with a force equal to 20 cwt. multiplied by 2304. Thus is conſtructed a hydro-mechanical engine, whereby a weight amounting to 2304 tons can be raiſed by a ſimple lever, through equal ſpace, in much leſs time than could be done by any apparatus conſtructed on the known principles of mechanics; and it may be proper to obſerve, that the effect of all other mechanical combinations is counteracted by an accumulated complication of parts, which renders them incapable of being uſefully extended beyond a certain degree; but in machines acted upon or conſtructed on this principle, every difficulty of this kind is obviated, and their power ſubject to no finite reſtraint. To prove this, it will be only neceſſary to remark, that the force of any machine acting upon this principle can be increaſed *ad infinitum*, either by extending the proportion between the diameter of the injector and the cylinder A, or by applying greater power to the lever H.

“ Fig. 5. repreſents the ſection of an engine, by which very wonderful effects may be produced inſtantaneouſly by means of compreſſed air. AA is a cylinder, with the piſton B fitting air-tight, in the ſame manner as deſcribed in fig. 4. C is a globular veſſel made of copper, iron, or other ſtrong materials, capable of reſiſting immenſe force, ſimilar to thoſe of air guns. D is a ſtrong tube of ſmall bore, in which is the ſtop-cock E. One of the ends of this tube communicates with the cylinder under the piſton B, and the other with the globe C. Now, ſuppoſe the cylinder A to be the ſame diameter as that in fig. 4. and the tube D equal to one quarter of an inch diameter, which is the ſame as the injector fig. 4.: then, ſuppoſe that air is injected into the globe C (by the common method), till it preſſes againſt the cock E. with a force equal to 20 cwt. which can eaſily be done; the conſequence will be, that when the cock E is opened, the piſton B will be moved in the cylinder AA with a power or force equal to 2304 tons; and it is obvious, as in the caſe fig. 4. that any other unlimited degree of force may be acquired by machines or engines thus conſtructed.

“ Fig. 6. is a ſection, merely to ſhew how the power and motion of one machine may, by means of fluids, be transferred or communicated to another, let their diſtance and local ſituation be what they may. A and B are two ſmall cylinders, ſmooth and cylindrical; in the inſide of each of which is a piſton, made water and air tight, as in figs. 4. and 5. CC is a tube conveyed under ground, or otherwiſe, from the bottom of one cylinder to the other, to form a communication between them, notwithſtanding their diſtance be ever ſo great;

this tube being filled with water or other fluid, until it touch the bottom of each piſton; then, by depreſſing the piſton A, the piſton B will be raiſed. The ſame effect will be produced *vice verſa*: thus bells may be rung, wheels turned, or other machinery put inviſibly in motion, by a power being applied to either.

"Fig. 7. is a ſection, ſhewing another inſtance of communicating the action and force of one machine to another; and how water may be raiſed out of wells of any depth, and at any diſtance from the place where the operating power is applied. A is a cylinder of any required dimenſions, in which is the working piſton B, as in the foregoing examples: into the bottom of this cylinder is inſerted the tube C, which may be of leſs bore than the cylinder A. This tube is continued, in any required direction, down to the pump cylinder D, ſuppoſed to be fixed in the deep well EE, and forms a junction therewith above the piſton F; which piſton has a rod G, working through the ſtuffing-box, as is uſual in a common pump. To this rod G is connected, over a pulley or otherwiſe, a weight H, ſufficient to overbalance the weight of the water in the tube C, and to raiſe the piſton F when the piſton B is lifted: thus, ſuppoſe the piſton B is drawn up by its rod, there will be a vacuum made in the pump cylinder D, below the piſton F; this vacuum will be filled with water through the ſuction pipe, by the preſſure of the atmoſphere, as in all pumps fixed in air. The return of the piſton B, by being preſſed downwards in the cylinder A, will make a ſtroke of the piſton in the pump cylinder D, which may be repeated in the uſual way by the motion of the piſton B, and the action of the water in the tube C. The rod G of the piſton F, and the weight H, are not neceſſary in wells of a depth where the atmoſphere will overbalance the water in the ſuction of the pump cylinder D, and that in the tube C. The ſmall tube and cock in the ciſtern I, are for the purpoſe of charging the tube C."

That theſe contrivances are ingenious, and may occaſionally prove uſeful, we are not inclined to controvert; but we muſt confeſs, that the advantages of them appear not to us ſo great as to their author. Why they do not, we need not explain to any man who, with a ſufficient degree of mechanical and mathematical knowledge, has peruſed this article with attention. *Mr John Luccock*, however, of Marley, near Leeds, thinks ſo very differently from us on this ſubject, that, on Mr Bramah's principle, he propoſes to apply water or other denſe fluids, ſo as to make them ſupply the place of ſteam in what is commonly called the *ſteam engine*. He calls his engine the *paradoxical machine;* and he got a patent for it on the 28th of February 1799, though it differs in nothing from Mr Bramah's machine, repreſented by fig. 4. except that the tube C in the paradoxical machine is ſupplied with water, not by means of a forcing pump, but from a ciſtern elevated to ſuch a height as, that the water deſcending through the tube may produce its effect merely by its weight. Whether this variation, for it is no improvement, of Mr Bramah's machine intitled its author to a patent, it is not our buſineſs to inquire.

Mac-Intoſh, || Macoketh.

MAC-INTOSH, a new county in the Lower diſtrict of Georgia, between Liberty and Glynn counties, on the Alatamaha river.—*Morſe.*

MAC-KENZIE'S *River*, in the N. W. part of N. America, riſes in Slave Lake, runs a N. N. W. courſe, and receives a number of large rivers, many of which are 250 yards wide, and ſome are 12 fathoms deep at the influx. It empties into the North Sea, at Whale Iſland in lat. 69° 14′, between 130° and 135° W. long. after a courſe of 780 miles from Slave Lake. It has its name from Mr M'Kenzie, who aſcended this river in the ſummer of 1789. He erected a poſt with his name engraven on it, on Whale Iſland, at the mouth of this river. He ſaw there a number of men and canoes, alſo a number of animals reſembling pieces of ice, ſuppoſed by him to be whales; probably ſea-horſes, deſcribed by Captain Cook. The tide was obſerved to riſe 16 or 18 inches. In ſome places the current of the river makes a hiſſing noiſe like a boiling pot. It paſſes through the Stony Mountains, and has great part of that range on the W. ſide. The Indian nations, inhabiting the W. ſide from the Slave Lake are the Strongbow, Mountain, and Hare Indians; thoſe on the E. ſide, the Beaver, Inland, Nathana, and Quarrelers, Indians. No diſcoveries W. of this river have been made by land.—*ib.*

MACOKETH, or *Mocoketch, River, Great,* empties into the Miſſiſſippi from the N. W. in N. lat. 42° 23′. *Little Macoketh* falls through the E. bank of the Miſſiſſippi, about 45 miles above the mouth of Great Macoketh, and oppoſite to the old Lead mine.—*ib.*

Macopin, || Macpherſon.

MACOPIN, a ſmall river, which empties into the Illinois, from the S. E. 18 miles from the Miſſiſſippi; is 20 yards wide, and navigable 9 miles to the hills. The ſhore is low on both ſides, clad with paccan, maple, aſh, button-wood, &c. The land abounds with timber, and is covered with high weeds.—*ib.*

MACORIZ, a ſmall river on the S. ſide of the iſland of St Domingo; 16 leagues E. of the city of St Domingo.—*ib.*

MACPHERSON (James, Eſq;), was born in the pariſh of Kinguſie, and county of Inverneſs, in the year 1738. His father was a farmer of no great affluence; and young Macpherſon received the earlier part of his education in one of the pariſh ſchools in the diſtrict called Badenoch. By an anonymous writer in the Edinburgh Magazine, he is ſaid to have been educated in the grammar ſchool of Inverneſs; and he may, for ought that we know to the contrary, have ſpent a year in that ſeminary; but we rather think that he went directly from a country ſchool to the univerſity of Aberdeen. At this our readers need not be ſurpriſed; for at the period to which we refer, ſome of the parochial ſchoolmaſters in Scotland, and more eſpecially in the Highlands, were men eminent for taſte and claſſical literature.

It was in the end of October or the 1ſt of November 1752, that James Macpherſon entered the King's College;

lege; where he diſplayed more genius than learning, entertaining the ſociety of which he was a member, and even diverting the younger part of it from their ſtudies, by his humorous and doggerel rhimes. About two years after his admiſſion into the univerſity, the King's College added two months to the length of its annual *ſeſſion* or *term;* which induced Macpherſon, with many other young men, to remove to the Mariſchal College, where the ſeſſion continued ſhort; and it is this circumſtance which leads us to ſuppoſe that his father was not opulent.

Soon after he left college, and perhaps before he left it, he was ſchoolmaſter of Ruthven, or Riven, of Badenoch; and we believe he afterwards delighted as little as his great antagoniſt Johnſon in the recollection of that period when he was compelled, by the narrowneſs of his fortune, to teach boys in an obſcure ſchool. It was during this period, we think in 1758, that he publiſhed *The Highlander*, an heroic poem in ſix cantos, 12mo. Of this work, as we have never ſeen it, we can ſay nothing. By the anonymous writer already quoted, it is mentioned as a "tiſſue of fuſtian and abſurdity;" whilſt others, and they too men of learning and character, have aſſured us, that it indicated conſiderable genius in ſo young an author.

Soon after this publication, Mr Macpherſon quitted his ſchool, and was received by Mr Graham of Balgowan into his family as tutor to his ſons; an employment of which he was not fond, and to which he was not long condemned. In the year 1760 he ſurpriſed the world by the publication of *Fragments of Ancient Poetry, collected in the Highlands of Scotland, and Tranſlated from the Gaelic or Erſe Language*, 8vo. Theſe fragments, which were declared to be genuine remains of ancient Scottiſh poetry, at their firſt appearance delighted every reader; and ſome very good judges, and amongſt the reſt Mr Gray, were extremely warm in their praiſes. Macpherſon had intended to bury them in a Scotch magazine, but was prevented from ſo injudicious a ſtep by the advice of a friend. He publiſhed them therefore in a pamphlet by themſelves, and thus laid the foundation of his future fortune.

As other ſpecimens were ſaid to be recoverable, a ſubſcription was ſet on foot by the Faculty of Advocates at Edinburgh, to enable our author to quit the family of Balgowan, perambulate the Highlands, and ſecure, if he could, the precious treaſure. He engaged in the undertaking, and was ſucceſsful; for all who poſſeſſed any of the long famed works, vied with each other in giving or ſending them to a man who had ſhewn himſelf ſo capable of doing them juſtice.

With his collection of poems, and fragments of poems, he went to London; and tagging them together in the form which he thought beſt, he publiſhed, in 1762, *Fingal, an Ancient Epic Poem, in ſix books*, together with ſeveral other poems, compoſed by Oſſian the ſon of Fingal, tranſlated from the Gaelic language, 4to. The ſubject of this epic poem is an invaſion of Ireland by Swaran king of Lochlin. Cuchullin, general of the Iriſh tribes during the minority of Cormac king of Ireland, upon intelligence of the invaſion, aſſembled his forces near Tura, a caſtle on the coaſt of Ulſter. The poem opens with the landing of Swaran; councils are held, battles fought, and Cuchullin is at laſt totally defeated. In the mean time, Fingal, king of the Highlands of Scotland, whoſe aid had been ſolicited before the enemy landed, arrived, and expelled them from the country. This war, which continued but ſix days and as many nights, is, including the epiſodes, the ſtory of the Poem. The ſcene, the heath of Lena, near a mountain called Cromleoch in Ulſter. This poem alſo was received with equal applauſe as the preceding Fragments.

The next year he produced *Temora*, an ancient epic poem, in eight books; together with ſeveral other poems compoſed by Oſſian ſon of Fingal, 4to, which, though well received, found the public ſomewhat leſs diſpoſed to beſtow the ſame meaſure of applauſe. Tho' theſe poems had been examined by Dr Blair and others, and their authenticity aſſerted, there were not wanting ſome of equal reputation for critical abilities, who either doubted or declared their diſbelief of the genuineneſs of them. Into this queſtion it would be ſuperfluous to enter here particularly, as we have ſaid enough on it elſewhere. See Ossian, *Encycl.*

That any man ſhould ſuppoſe Macpherſon, after his tranſlation of Homer, the *author* of the poems which he aſcribes to Oſſian, appears to us very extraordinary; and it is little leſs extraordinary, that any one ſhould, for a moment, believe in the exiſtence of *manuſcripts* of theſe poems of *very high* antiquity. Part of them he undoubtedly received in manuſcript from Macdonald of Clanronald; but we can affirm, on the beſt authority, that the ſaid manuſcript was written at different times by the Macvurichs, hereditary bards to that family. He may likewiſe have received ſhort manuſcripts elſewhere; but every Highland gentleman of learning and of candour (and none elſe have a right to decide on this queſtion), declares, that by much the greater part of the poems had been preſerved in fragments and popular ſongs from a very remote age by oral tradition. To theſe fragments Macpherſon and his aſſociates (A) gave form; and it was by uniting together fragments of different ages, that he inadvertently furniſhed Gibbon and others with the opportunity of objecting, that the poems are ſometimes inconſiſtent with the truth of hiſtory. This, however, is no ſolid objection to their authenticity; for every Weſt Highlander ſixty years of age remembers to have heard, in his youth, great part of thoſe poems repeated by old men; and is confident that, many centuries ago, the names of *Fiune Mackuil* (Fingal), and of Oſſian's other heroes and heroines, were as familiar to a Highland ear, as the names of Agamemnon, Hector, Helen, &c. were to a Grecian ear at the time when the poems of Homer were reduced into their preſent form. For the ſubſtance of the poems, this is ſuch evidence as none will reject who does not prefer his own cobweb theories to the united teſtimony of a whole people.

With reſpect to authenticity, the poems of Oſſian have

(A) We have been aſſured that he had aſſociates: and that for the deſcription of Cuchullin's chariot in particular he was indebted to Mr Macpherſon of *Stramazhie;* a man of native genius, and though not poſſeſſed of very extenſive erudition, well acquainted with Gaelic poetry.

have indeed been compared with the poems of Rowley; but the compariſon is abſurd. The poems of the Celtic bard were not found in an old cheſt, and preſented to a people who had never before heard either of them or of their author; they were the popular ſongs and traditions of ages collected together, and reduced into form, with additions occaſionally made by the tranſlator. It is ridiculous to aſk how theſe ſongs and ſtories could be ſo long preſerved among a rude and illiterate people; for it is only among ſuch a people, whoſe objects of purſuit are too few to occupy all their attention, that the exploits of their anceſtors can be handed down by tradition; and the moſt ſerious objection which we have ever met with to the tranſlator's account of the origin of the poems, ariſes from his having pretended that he received the greater part of them in old manuſcripts.

After the publication of Oſſian's poems, by which we have reaſon to believe that he gained twelve hundred pounds, Mr Macpherſon was called to an employment which withdrew him, for ſome time, both from the muſes and from his country. Captain Johnſtone was appointed governor of Penſacola, and Mr Macpherſon accompanied him as his ſecretary, being at the ſame time made ſurveyor general of the Floridas. If our memory does not deceive us, ſome difference aroſe between the principal and his dependant, and they parted before their return to England. Having contributed his aid to the ſettlement of the civil government of that colony, he viſited ſeveral of the Weſt India iſlands, and ſome of the provinces of North America, and returned to England in the year 1766, where he retained for life his ſalary as ſurveyor, which we believe was L.200 a-year.

He ſoon returned to his ſtudies, and in 1771 produced *An Introduction to the Hiſtory of Great Britain and Ireland*, 4to; a work which he ſays, "without any of the ordinary incitements to literary labour, he was induced to proceed in by the ſole motive of private amuſement." The ſubject of this performance, it might reaſonably be ſuppoſed, would not excite any violent controverſial acrimony; yet neither it nor its author could eſcape from ſeveral moſt groſs and bitter invectives, for ſome of which he perhaps gave too great occaſion.

His next performance produced him neither reputation nor profit. In 1773 he publiſhed, *The Iliad of Homer*, tranſlated in two volumes 4to; a work fraught with vanity and ſelf-conſequence, and which met with the moſt mortifying reception from the public. It was condemned by the critics, ridiculed by the wits, and neglected by the world. Some of his friends, and particularly Sir John Elliott, endeavoured to reſcue it from contempt, and force it into notice. Their ſucceſs was not equal to their efforts.

About this time ſeems to be the period of Mr Macpherſon's literary mortifications. In 1773 Dr Johnſon and Mr Boſwell made the tour to the Hebrides; and in the courſe of it, the former took ſome pains to examine into the proofs of the authenticity of Oſſian. The reſult of his inquiries he gave to the public in 1775, in his narrative of the tour; and his opinion was unfavourable. "I believe they (*i. e.* the poems, ſays he), never exiſted in any other form than that which we have ſeen. The editor or author never could ſhew the original; nor can it be ſhewn by any other. To revenge reaſonable incredulity by refuſing evidence, is a degree of inſolence with which the world is not yet acquainted; and ſtubborn audacity is the laſt refuge of guilt. It would be eaſy to ſhew it if he had it. But whence could it be had? It is too long to be remembered, and the language had formerly nothing written. He has doubtleſs inſerted names that circulate in popular ſtories, and may have tranſlated ſome wandering ballads, if any can be found; and the names and ſome of the images being recollected, make an inaccurate auditor imagine that he has formerly heard the whole."

Again, he ſays, "I have yet ſuppoſed no impoſture but in the publiſher; yet I am far from certainty, that ſome tranſlations have not been lately made, that may now be obtruded as parts of the original work.

"Credulity on the one part is a ſtrong temptation to deceit on the other, eſpecially to deceit of which no perſonal injury is the conſequence, and which flatters the author with his own ingenuity. The Scotts have ſomething to plead for their eaſy reception of an improbable fiction: they are ſeduced by their fondneſs for their ſuppoſed anceſtors. Neither ought the Engliſh to be much influenced by Scotch authority; for of the paſt and preſent ſtate of the whole Erſe nation, the Lowlanders are at leaſt as ignorant as ourſelves. To be ignorant is painful; but it is dangerous to quiet our uneaſineſs by the deluſive opiate of haſty perſuaſion."

Theſe reaſonings, if reaſonings they can be called, might have been eaſily anſwered, had not Macpherſon pretended to the poſſeſſion of at leaſt one manuſcript which certainly never exiſted. He did not, however, attempt to anſwer them; but adopted a mode of proceeding which tended only to convince the world that Johnſon's opinion had ſome foundation, and that the editor of Oſſian had more imagination than ſound judgment. Prompted by his evil genius, he ſent a menacing letter to his illuſtrious antagoniſt, which produced the following brief but ſpirited reply.

"Mr James Macpherſon, No date.

"I received your fooliſh and impudent letter. Any violence that ſhall be offered to me, I will do my beſt to repel; and what I cannot do for myſelf, the law ſhall do for me; for I will not be hindered from expoſing what I think a cheat, by the menaces of a ruffian. What! Would you have me retract? I thought your work an impoſition: I think ſo ſtill; and, for my opinion, I have given reaſons, which I dare you to refute. Your abilities, ſince your *Homer*, are not ſo formidable; and what I hear of your morality, inclines me to believe rather what you ſhall prove than what you ſhall ſay."

Whether this letter ſhewed to Macpherſon the imprudence of his conduct, or that he had been made ſenſible of his folly by the interpoſition of friends, we know not; but certain it is, we hear no more afterwards of this ridiculous affair, except that our author is ſuppoſed to have aſſiſted Mr Macnicol in an anſwer to Dr Johnſon's Tour, printed in 1779. This ſuppoſition we are inclined to conſider as well-founded, becauſe we have been told by a gentleman of veracity, that Mr Macnicol affirms, that the ſcurrility of his book, which conſtitutes a great part of it, was inſerted unknown to him, after the manuſcript was ſent for publication to London.

In 1775 Mr Macpherſon publiſhed *The Hiſtory of Great Britain from the Reſtoration to the Acceſſion of the Houſe of Hanover*, in two volumes 4to; a work in our opinion of great merit, though by one party it has been induſtriouſly, and, we are ſorry to add, too ſucceſsfully, decried. As an hiſtorian, our author could not indeed boaſt the attic elegance of a Robertſon, the ſplendour of a Gibbon, or the philoſophical profundity of a Hume; but his *ſtyle*, though it has ſometimes been the avowed, was not the real, cauſe of the coldneſs with which his hiſtory was received. The writer of this ſketch once ſaw a gentleman of rank, and of the Whig intereſt, turn over one of Macpherſon's volumes, and heard him ſay, upon ſhutting the book, "I cannot bear that work." He was aſked if he thought the narrative falſe? and he replied, "No! It is too true; but I cannot bear it, becauſe it gives me a bad opinion of thoſe great men to whom I have been accuſtomed to look back with reverence as to the ſaviours of my country."

That it has been abhorred by others on the ſame account, we have not a doubt; and yet language has no name too contemptuous for thoſe who will not follow truth whitherſoever ſhe may lead them; or who, on the abſurd pretence of having already made up their minds, will not ſtudy the evidence on both ſides of a diſputed queſtion in our national hiſtory. A man needs not ſurely diſapprove of the Revolution, or of the ſubſequent ſettlements, though he ſhould find complete proofs that Danby and Sunderland were crooked politicians, that Marlborough was ungrateful, or even that King William himſelf was not that upright and diſintereſted character which from their infancy they have been taught to believe. It is no uncommon thing for Divine Providence to accompliſh good ends by wicked inſtruments. Every Proteſtant ſurely conſiders the Reformation as one of the moſt bleſſed events that have taken place in the world ſince the firſt preaching of the goſpel of Chriſt; yet he would be a hardy champion who ſhould undertake to vindicate the motives which influenced the conduct of the firſt reformers—of Henry VIII. for inſtance, or even of Luther himſelf. And why may not the Revolution be conſidered as in the higheſt degree beneficial to the country, though the conduct of ſome of thoſe who brought it about ſhould be found to be ſuch as Macpherſon repreſents it?

That author certainly acted with great fairneſs; as together with the hiſtory he publiſhed the proofs upon which his facts were founded, in two quarto volumes, intitled, *Original Papers, containing the ſecret Hiſtory of Great Britain, from the Reſtoration to the Acceſſion of the Houſe of Hanover; to which are prefixed, Extracts from the Life of James II. as written by himſelf.* Theſe papers were chiefly collected by Mr Carte, but are not all of equal authority. They, however, clear up many obſcurities, and ſet the characters of many perſons in paſt times in a different light from that in which they have been uſually viewed. On this account we have no heſitation to ſay, that he who is capable of ſacrificing prejudice to truth, and wiſhes to underſtand the politics of the reigns of James, and William, and Anne, ſhould ſtudy with care the volumes of Macpherſon.

Soon after this period, the tide of fortune flowed very rapidly in Mr Macpherſon's favour, and his talents and induſtry were amply ſufficient to avail himſelf of every favourable circumſtance which aroſe. The reſiſtance of the Colonies called for the aid of a ready writer to combat the arguments of the Americans, and to give force to the reaſons which influenced the conduct of government, and he was ſelected for the purpoſe. Among other things (of which we ſhould be glad to receive a more particular account), he wrote a pamphlet, which was circulated with much induſtry, intitled, *The Rights of Great Britain aſſerted againſt the Claims of the Colonies; being an Anſwer to the Declaration of the General Congreſs*, 8vo, 1776, and of which many editions were publiſhed. He alſo was the author of *A ſhort Hiſtory of Oppoſition during the laſt Seſſion of Parliament*, 8vo, 1779; a pamphlet which, on account of its merit, was by many aſcribed to Mr Gibbon.

But a more lucrative employment was conferred on him about this time. He was appointed agent to the nabob of Arcot, and in that capacity exerted his talents in ſeveral appeals to the public in behalf of his client. Among others, he publiſhed, *Letters from Mahommed Ali Chan, Nabob of Arcot, to the Court of Directors; to which is annexed, a State of Facts relative to Tanjore, with an Appendix of Original Papers, 4to*, 1777; and he was ſuppoſed to be the author of *The Hiſtory and Management of the Eaſt India Company from its Origin in* 1600 *to the preſent Times*, vol. i. containing the affairs of the Carnatic, in which the rights of the nabob are explained, and the injuſtice of the Company proved, 4to, 1779.

In his capacity of agent to the nabob, it was probably thought requiſite that he ſhould have a ſeat in the Britiſh Parliament. He was accordingly in 1780 choſen member for Camelford; but we do not recollect that he ever attempted to ſpeak in the Houſe. He was alſo rechoſen in 1784 and 1790.

He had purchaſed, we think before the year 1790, an eſtate in the pariſh in which he was born; and changing its name from *Retz* to *Belville*, built on it a large and elegant manſion, commanding a very romantic and pictureſque view; and thither he retired, when his health began to fail, in expectation of receiving benefit from the change of air. He continued, however, to decline, and after lingering ſome time, died at his ſeat at Belville, in Inverneſs, on the 17th of February 1796.

He appears to have died in very opulent circumſtances; and by his will, dated June 1793, gave various annuities and legacies to ſeveral perſons to a great amount. He alſo bequeathed L.1000 to John Mackenzie of Figtree Court, in the Temple, London, to defray the expence of printing and publiſhing Oſſian in the original. He directed L.300 to be laid out in erecting a monument to his memory in ſome conſpicuous ſituation at Belville, and ordered that his body ſhould be carried from Scotland and interred in the Abbey Church of Weſtminſter, the city in which he had paſſed the beſt part of his life. His remains were accordingly taken from the place where he died, and buried in the Poets Corner of Weſtminſter church.

MACUNGY, a townſhip in Northampton county, Pennſylvania.—*Morse.*

MAD, a river, called alſo *Pickawa Fork*, a rapid branch of the great Miami, having a S. W. courſe. It is a beautiful ſtream, paſſing through a pleaſant level country of the greateſt fertility.—*ib.*

MADAME, *Iſle*, forms the N. E. ſide of the Gut of Canſo, as you enter from the S. E. and is oppoſite to the eaſtern extremity of Nova-Scotia. The north point of the iſland lies 14 miles ſoutherly of St Peter's harbour, in Cape Breton iſland. The iſles de Madame are dependent on Cape Breton iſland.—*ib.*

MADBURY, a townſhip in Strafford county, New-Hampſhire, ſituated between Dover and Durham, about 10 miles N. W. of Portſmouth. It was incorporated in 1755, and has 592 inhabitants.—*ib.*

MADDISON, a county of Kentucky, adjoining Fayette, Clarke, Lincoln, and Mercer counties. Chief town, Milford.—*ib.*

Maddison, a ſmall town of Amherſt county, Virginia; ſituated on the N. ſide of James's river, oppoſite Lynchburg. It lies 150 miles W. by N. of Richmond.—*ib.*

MADDISON'S CAVE, the largeſt and moſt celebrated cave in Virginia, ſituated on the N. ſide of the Blue Ridge. It is in a hill of about 200 feet perpendicular height, the aſcent of which, on one ſide is ſo ſteep, that you may pitch a biſcuit from its ſummit into the river which waſhes its baſe. The entrance of the cave is in this ſide, about two-thirds of the way up. It extends into the earth about 300 feet, branching into ſubordinate caverns, ſometimes aſcending a little, but more generally deſcending, and at length terminates in two different places, at baſons of water of unknown extent, and which appear to be nearly on a level with the water of the river. The vault of this cave is of ſolid lime-ſtone, from 20 to 40 or 50 feet high, through which water is continually exuding. This trickling down the ſides of the cave, has incruſted them over in the form of elegant drapery; and dripping from the top of the vault, generates on that, and on the baſe below, ſtalactites of a conical form, ſome of which have met and formed large maſſy columns.—*ib.*

MADERA, or *Madeira*, one of the largeſt branches of the famous Maranon or river of Amazons, in S. America. In 1741, the Portugueſe ſailed up this ſtream, till they found themſelves near Santa Cruz de la Sierra, between lat. 17° and 18° S. From the mouth of this river in lat. 3° 20′ S. the Maranon is known among the inhabitants by the name of the river of Amazons; and upwards they give it the name of the river of Solimoes. At Loretto, the Madera receives two branches from the ſouth. From Loretto to Trinidad in lat. 15° S. its courſe is north: thence to its mouth its general courſe is N. E. by N. and N.—*ib.*

MADRE DE POPA, a town and convent of Terra Firma in S. America, ſituated on the river Grande, or Magdalena. The pilgrims in South America reſpect this religious foundation with zeal, and reſort to it in great numbers: many miracles being ſaid to have been wrought here by the Holy Virgin, in favour of the Spaniſh fleets and their ſailors, who are therefore very liberal in their donations at her ſhrine. It lies 54 miles E. of Carthagena. N. lat. 10° 51′, W. long. 76° 15′.—*ib.*

MAGDALEN *Iſles*, a cluſter of iſles N. E. of the iſle of St John's, and N. W. of that of Cape Breton, in the gulf of St Lawrence; ſituated between 47° 13′ and 47° 42′ N. lat. and in 61° 40′ W. long. They are inhabited by a few fiſhermen. Sea-cows uſed to frequent them; but they are now become ſcarce. Theſe iſles have been fatal to many veſſels. The chief of them are the Dead Man, Entry, and Romea iſlands. Seamen wiſh to make them in fair weather, as they ſerve them to take a new departure; but in foggy weather or blowing weather they as ſtudiouſly avoid them.—*ib.*

MAGDALENA, *La*, one of the Marqueſas Iſlands in the South Sea; about 6 leagues in circuit, and has a harbour under a mountain on its ſouth ſide nearly in lat. 10° 25′ S. long. 138° 50′ W.—*ib.*

Magdalena, a river of Louiſiana, which empties into the gulf of Mexico, W. by S. of Mexicano river.—*ib.*

Magdalena, a large river, the two principal ſources of which are at no great diſtance from the city of Popayan, in Terra Firma. Belcazar, by going down this river, found a paſſage to the North Sea. The river, after uniting its waters with the Cance, takes the name of Grande, and falls into the North Sea below the town of Madre de Popa. The banks of this great river are well inhabited, and it has a courſe of above 200 leagues. Its mouth is much frequented by ſmugglers, and conveys to Carthagena the productions of New Granada, viz. gold and grain. Among many other conſiderable places on its banks are Malambito, Teneriffe, Talaygua, Monpox, Tamalameque, &c.—*ib.*

MAGDALENE, *Cape of*, a promontory in the centre of Canada, where there is an iron mine, which promiſes great advantages, both with regard to the goodneſs of the metal and the plenty of the ore.—*ib.*

MAGEE'S *Sound*, on the N. W. coaſt of N. America, is ſituated in Waſhington's Iſlands, or what the Britiſh call Edward's, or Charlotte's Iſles, ſo called by two different captains on their firſt falling in with them. Lat. 52° 46′ N. long. 131° 46′ W. This ſound is divided by Dorr's Iſland into two parts, leading into one. The other port is called Port Perkins.—*ib.*

MAGEGADAVICK, or *Magacadava*, or *Eaſtern River*, falls into the bay of Paſſamaquoddy, and is ſuppoſed to be the true St Croix, which forms part of the eaſtern boundary line between the United States and New-Brunſwick. This diſputed line is now in train for ſettlement, agreeably to the treaty of 1794.—*ib.*

MAGELLAN, *Straits of*, at the ſouth extremity of S. America, lie between 52° and 54° S. lat. and between 76° and 84° W. longitude. Theſe ſtraits have Patagonia on the N. and the iſlands of Terra del Fuego on the S. and extend from E. to W. 110 leagues, but the breadth in ſome places falls ſhort of one. They were firſt diſcovered by Magellan, or Magelhaens, a Portugueſe, in the ſervice of Spain, who, in 1520 found out thereby a paſſage from the Atlantic to the Pacific or Southern ocean. He was the firſt navigator who ſailed round the world.—*ib.*

MAGELLANIA, or *Terra Magellanica*, a vaſt tract of land, extending from the province of Rio de la Plata, quite to the utmoſt verge of S. America, viz. from lat. 35° to 54° S. The river Sinfondo divides the W. part from the S. of Chili: the northern part of it alſo borders on Chili, and Cuyo or Chicuito on the W. The South Sea bounds it, in part, on the W. The N. ocean wholly on the E. and ſtraits of Magellan on the S. Magellan himſelf made no great diſcoveries in this country, except the two capes, of Virgins and Deſire. The two principal nations diſcovered by the miſſionaries, are, the Chunians and Huillans; the former inhabit the continent, and ſeveral iſlands, to the northward of the Huillans, who inhabit the country near Magellan Straits. The ſoil is generally barren, hardly bearing any grain, and the trees exhibit a diſmal aſpect; ſo that the inhabitants live miſerably in a cold, inhoſpitable climate. The Huillans are not numerous, being hunted like wild beaſts, by the Chunians, who ſell them for ſlaves. The other nations are not known, much leſs their genius or manner of living. The eaſtern coaſts of Magellan are generally low, abounding with bogs, and have ſeveral iſlands near the ſhore; the moſt remarkable of which is the Iſle of Penguins, ſo called from a bird of that name, which abounds on it. The iſlands S. of the ſtraits are Terra del Fuego; as there is a vulcano in the largeſt of them, emitting fire and ſmoke, and appears terrible in the night. The Spaniards erected a fort on this ſtrait, and placed a garriſon in it; but the men were all ſtarved.—*ib.*

MAGMA is properly the *refuſe* of any ſubſtance which has been ſubjected to preſſure; but, in chemiſtry, the term is ſometimes uſed to denote a mixture of two or more bodies, reduced to the conſiſtence of dough or paſte.

MAGNETISM,

IN natural philoſophy.—Our intention in the preſent article was principally to give a more diſtinct account of the theory of Mr Æpinus than is contained in the article Magnetism of the *Encyclopædia*, referring for proof and illuſtration to the many facts contained in that article: but, on more mature conſideration, we concluded, that this method would fret and confuſe the reader by continual references, and leave but a feeble impreſſion at laſt. We have therefore preferred the putting the whole into the form of a ſhort treatiſe on magnetiſm, ſimilar to our ſupplementary article of Electricity. This, we hope, will be more perſpicuous and ſatisfactory; ſtill leaving to the reader the full uſe of all the information contained in the article Magnetism of the Dictionary.

1 Reaſons why the ancients were ignorant of natural philoſophy.

The knowledge which the ancient naturaliſts poſſeſſed of this ſubject was extremely imperfect, and affords, we think, the ſtrongeſt proof of their ignorance of the true method of philoſophiſing; for there can hardly be named any object of phyſical reſearch that is more curious in itſelf, or more likely to engage attention, than the apparent life and activity of a piece of rude unorganiſed matter. This had attracted notice in very early times; for Thales attributed the characteriſtic phenomenon, the attraction of a piece of iron, to the agency of a mind or ſoul reſiding in the magnet. Philoſophers, as they were called, ſeem to have been contented with this lazy notice of a ſlight ſuggeſtion, unbecoming an inquirer, and rather ſuch as might be expected from the moſt incurious peaſant. Even Ariſtotle, the moſt zealous and the moſt ſyſtematic ſtudent of Nature of whoſe labours we have any account, has collected no information that is of any importance. We know that the general imperfection of ancient phyſics has been aſcribed to the little importance that was attached to the knowledge of the material world by the philoſophers of Greece and Rome, who thought human nature, the active purſuits of men, and the ſcience of public affairs, the only objects deſerving their attention. Moſt of the great philoſophers of antiquity were alſo great actors on the ſtage of human life, and deſpiſed acquiſitions which did not tend to accompliſh them for this dignified employment: but they have not given this reaſon themſelves, though none was more likely to be uppermoſt in their mind. Socrates diſſuades from the ſtudy of material nature, not becauſe it was unworthy of the attention of his pupils, but becauſe it was too difficult, and that certainty was not attainable in it. Nothing can more diſtinctly prove their ignorance of what is really attainable in ſcience, namely, the knowledge of the *laws of nature*, and their ignorance of the only method of acquiring this knowledge, viz. obſervation and experiment. They had entertained the hopes of diſcovering the *cauſes* of things, and had formed their philoſophical language, and their mode of reſearch, in conformity with this hopeleſs project. Making little advances in the diſcovery of the cauſes of the phenomena of material nature, they deſerted this ſtudy for the ſtudy of the conduct of man; not becauſe the diſcovery of cauſes was more eaſy and frequent here, but becauſe the ſtudy itſelf was more immediately intereſting, and becauſe any thing like ſuperior knowledge in it puts the poſſeſſor in the deſirable ſituation of an adviſer, a man of ſuperior wiſdom; and as this ſtudy was cloſely connected with morals, becauſe the fear of God is truly the beginning of wiſdom, the character of the philoſopher acquired an eminence and dignity which was highly flattering to human vanity. Their procedure in the moral and intellectual ſciences is ſtrongly marked with the ſame ignorance of the true method of philoſophiſing; for we rarely find them forming general propoſitions on copious inductions of facts in the conduct of men. They always proceed in the ſynthetic method, as if they were fully converſant in the firſt principles of human nature, and had nothing to do but to make the application, according to the eſtabliſhed forms of logic. While we admire, therefore, the ſagacity, the penetration, the candid obſervation, and the happy illuſtration, to be found in the works of the ancient moraliſts and writers on juriſprudence and politics, we cannot but lament that ſuch great men, frequently engaged in public affairs, and therefore having the fineſt opportunities for deducing general laws, have done ſo little in this way; and that their writings, however engaging and precious, cannot be conſidered as any thing more refined than the obſervations of judicious and worthy men, with all the diffuſeneſs and repetition of ordinary converſation. All this has ariſen from the want of a juſt notion of what is attainable in this department of ſcience, namely, the laws of intellectual and moral nature; and of the only poſſible method of attaining this knowledge, viz. obſervation and experiment, and the formation of general laws by the induction of particular facts.

2 Dr Gilbert was the firſt experimental enquirer about magnetiſm.

We have been led into theſe reflections by the inattention of the ancients to the curious phenomena of magnetiſm; which muſt have occurred in conſiderable and entertaining variety to any perſon who had taken to the experimental method. And we have hazarded theſe free remarks, expecting the acquieſcence of our readers, becauſe the ſuperior knowledge which we, in theſe later days, have acquired of the magnetical phenomena, were the firſt fruits of the true method of philoſophiſing. This was pointed out to the learned world in 1590 by our celebrated countryman Chancellor Bacon, in his two great works, the *Novum Organum Scientiarum*, and *De Argumentis Scientiarum*. Dr Gilbert of Colcheſter, a philoſopher of eminence in many reſpects, but chiefly becauſe he had the ſame juſt views of philoſophy with his noble countryman, publiſhed about the ſame time his *Phyſiologia Nova, ſeu Tractatus de Magnete et Corporibus magneticis.* In the introduction, he recounts all the knowledge of the ancients on the ſubject, and their ſupine inattention to what was ſo entirely in their hands; and the impoſſibility of ever adding to the ſtock of uſeful knowledge, ſo long as men imagined themſelves to be philoſophiſing while they were only repeating a few cant words, and the unmeaning phraſes of the Ariſtotelian ſchool. It is curious to remark the almoſt perfect ſameneſs of Dr Gilbert's ſentiments and language with thoſe of Lord Bacon. They both charge, in a peremptory manner, all thoſe who pretend to inform others, to give over their dialectic labours, which are nothing but ringing changes on a few trite truths, and many unfounded conjectures, and immediately to betake themſelves to experiment. He has purſued this method on the ſubject of magnetiſm with wonderful ardour, and with equal genius and ſucceſs; for Dr Gilbert was poſſeſſed both of great ingenuity, and a mind fitted for general views of things. The work contains a prodigious number and variety of obſervations and experiments, collected with ſagacity from the writings of others, and inſtituted by himſelf with conſiderable expence and labour. It would indeed be a miracle, if all Dr Gilbert's general inferences were juſt, or all his experiments accurate. It was untrodden ground. But, on the whole, this performance contains more real information than any writing of the age in which he lived, and is ſcarcely exceeded by any that has appeared ſince. We may hold it with juſtice as the firſt fruits of the Baconian or experimental philoſophy.

This work of Dr Gilbert's relates chiefly to the loadſtone, and what we call magnets, that is, pieces of ſteel which have acquired properties ſimilar to thoſe of the loadſtone. But he extends the term *magnetiſm*, and the epithet *magnetic*, to all bodies which are affected by loadſtones and magnets in a manner ſimilar to that in which they affect each other. In the courſe of his inveſtigation, indeed, he finds that theſe bodies are only ſuch as contain iron in ſome ſtate or other: and in proving this limitation, he mentions a great variety of phenomena which have a conſiderable reſemblance to thoſe which he allows to be magnetical, namely, thoſe which he called *electrical*, becauſe they were produced in the ſame way that amber is made to attract and repel light bodies. He marks with care the diſtinctions between theſe and the characteriſtic phenomena of magnets. He ſeems to have known, that all bodies may be rendered electrical, while ferrugineous ſubſtances alone can be made magnetical.

3 His treatiſe contains many diſcoveries.

It is not ſaying too much of this work of Dr Gilbert's to affirm, that it contains almoſt every thing that we know about magnetiſm. His unwearied diligence in ſearching every writing on the ſubject, and in getting information from navigators, and his inceſſant occupation in experiments, have left very few facts unknown to him. We meet with many things in the writings of poſterior inquirers, ſome of them of high reputation, and of the preſent day, which are publiſhed and received as notable diſcoveries, but are contained in the rich collection of Dr Gilbert. We by no means aſcribe all this to mean plagiariſm, although we know traders in experimental knowledge who are not free from this charge. We aſcribe it to the general indolence of mankind, who do not like the trouble of conſulting originals, where things are mixed with others which they do not want, or treated in a way, and with a painful minuteneſs, which are no longer in faſhion. Dr Gilbert's book, although one of thoſe which does the higheſt honour to our country, is leſs known in Britain than on the continent. Indeed we know but of two Britiſh editions of it, which are both in Latin; and we have ſeen five editions publiſhed in Germany and Holland before 1628. We earneſtly recommend it to the peruſal of the curious reader. He will (beſides the ſound philoſophy) find more facts in it than in the two large folios of Scarella.

After this moſt deſerved eulogy on the parent of magnetical philoſophy, it is time to enter on the ſubject.

4 We can only claſs the phenomena.

In mechanical philoſophy, a phenomenon is not to be conſidered as explained, unleſs we can ſhew that it is the certain reſult of the laws of motion applied to matter. It is in this way that the general propoſitions in phyſical aſtronomy, in the theory of machines, in hydraulics, &c. are demonſtrated. But the phenomena called *magnetical* have not as yet obtained ſuch an explanation. We do not ſee their immediate cauſe, nor can we ſay with confidence that they are the effects of any particular kind of matter, acting on the bodies either by impulſion or preſſure.

All that can be done here is to claſs the phenomena in the moſt diſtinct manner, according to their generality. In this we obtain a two-fold advantage. We may take it for granted that the moſt general phenomenon is the neareſt allied to the general cauſe. But, farther, we obtain by this method a true theory of all the ſubordinate phenomena. For a juſt theory is only the pointing out the general fact of which the phenomenon under conſideration is a particular inſtance. Beginning therefore with the phenomenon which comprehends all the particular caſes, we explain thoſe caſes in ſhewing *in what manner* they are included in the general phenomenon, and thus we ſhall be able to predict what will be the reſult of putting the body under conſideration into any particular ſituation. And perhaps we may find, in them all, coincidences which will enable us to ſhew that they are all modifications of a fact ſtill more general. If we gain this point, we ſhall have eſtabliſhed a complete theory of them, having diſcovered the general fact in which they are all comprehended. Should we for ever remain ignorant of the cauſe of this general fact, we have nevertheleſs rendered this a complete branch of mechanical theory. Nay, we may perhaps diſcover ſuch circumſtances of reſemblance between this general fact and others, with which we are better acquainted, that we ſhall, with great probability at leaſt, be able to aſſign the cauſe of the general fact itſelf, by ſhewing the law of which it is a particular inſtance.

We ſhall attempt this method on the preſent occaſion.

5
Firſt leading fact.

The leading facts in magnetiſm are the two following:

Iron arranges itſelf in a particular poſition.

1. If any oblong piece of iron, ſuch as a bar, rod, or wire, be ſo fitted, that it can aſſume any direction, it will arrange itſelf in a certain determinate direction with reſpect to the axis of the earth. Thus, if, in any part of Britain, an iron or ſteel wire be thruſt through a piece of cork, as repreſented in fig. 1. ſo as that the whole may ſwim level in water, and if it be laid in the water nearly north-weſt and ſouth-eaſt, it will ſlowly change its poſition, and finally ſettle in a direction, making an angle of about 25 degrees with the meridian.

Plate XXXIV.

This experiment, which we owe to Dr Gilbert (ſee B. I. ch. 11.), is delicate, and requires attention to many circumſtances. The force with which the iron tends toward this final poſition is extremely weak, and will be balanced by very minute and otherwiſe inſenſible reſiſtances; but we have never found it fail when executed as here directed. An iron wire of the ſize of an ordinary quill, and about eight or ten inches long, is very fit for the purpoſe. It ſhould be thruſt through the cork at right angles to its axis; and ſo adjuſted, by repeated trials, as to ſwim level or parallel to the horizon. The experiment muſt alſo be made at a great diſtance from all iron; therefore in a baſon of ſome other metal or earthen ware. It may ſometimes require a very long while before the motion begin; and if the wire has been placed at right angles to the direction which we have mentioned as final, it will never change its poſition: therefore we have directed it to be laid in a direction not too remote, yet very ſenſibly different from the final direction.

But this is not the true poſition affected by the iron rod. If it be thruſt through a piece of wood or cork perfectly ſpherical, in ſuch a manner that it paſſes thro' its centre, and if the centre of gravity coincide with this centre, and the whole be of ſuch weight as to remain in any part of the water, without either aſcending or deſcending, then it will finally ſettle in a plane inclined to the meridian about 25°, and the north end will be depreſſed about 73° below the horizon.

All this is equivalent with ſaying, that if any oblong piece of iron or ſteel be very nicely poiſed on its centre of gravity, and at perfect liberty to turn round that centre in every direction, it will finally take the poſition now mentioned.

We have farther to obſerve with regard to this experiment, that it is indifferent which end of the rod be placed toward the north in the beginning of the experiment. That end will finally ſettle toward the north; and if the experiment be repeated with the ſame rod, but with the other end north, it will finally ſettle in this new attitude. It is, however, not always that we find pieces of iron thus perfectly indifferent. Very frequently one end affects the northerly poſition, and we cannot make the other end aſſume its place: the cauſes of this difference will be clearly ſeen by and bye.

6
MAGNETICAL POSITION.

The poſition thus affected by a rod of iron is called by Dr Gilbert the MAGNETICAL POSITION OR DIRECTION. It is not the ſame, nor parallel, in all parts of the earth, as will be more particularly noticed afterwards.

7
Second fact.
Iron attracts and repels iron.

2. The other leading fact is this: When a piece of iron, lying in the *magnetical* poſition, or nearly ſo, and at perfect liberty to move in every direction, is approached by another oblong piece of iron, held nearly in the ſame poſition, it is attracted by it; that is, the moveable piece of iron will gradually approach to the one that is preſented to it, and will at laſt come into contact with it, and may then be ſlowly drawn along by it.

This phenomenon, although not ſo delicate as the former, is ſtill very nice, becauſe the attraction is ſo weak that it is balanced by almoſt inſenſible obſtructions. But the experiment will ſcarcely fail if conducted as follows: Let a ſtrong iron wire be made to float on water by means of a piece of cork, in the manner already deſcribed, having one end under water. See fig. 1. B.

When it is nearly in the magnetical poſition, bring the end of a pretty big iron rod, ſuch as the point of a new poker, within a quarter of an inch of its ſouthern end (holding the poker in a poſition not very different from the magnetical poſition), and hold it there for ſome time, not exactly ſouthward from it, but a little to one ſide. The floating iron will be obſerved to turn towards it with an accelerated motion; will touch it, and may then be drawn by it through the water in any direction. We ſhall have the ſame reſult by approaching the northern extremity of the floating iron with the upper end of the poker.

The ſame phenomenon may be obſerved by ſuſpending the firſt piece of iron by its middle by a long and ſlender hair or thread. The ſuſpenſion muſt be long, otherwiſe the ſtiffneſs of the hair or thread may be ſufficient for balancing the very ſmall force with which the pieces of iron tend toward each other. The phenomenon may alſo be obſerved in a piece of iron which turns freely on a fine point, like the needle of the mariner's compaſs.

In this, as in the former experiment, the ends of the pieces of iron are obſerved, in general, to be indifferent; that is either end of the one will attract either end of the other. It often happens, however, that the ends are not thus indifferent, and that the end of the moveable piece of iron, inſtead of approaching the other, will be obſerved to recede from it, and appear to avoid it. We ſhall ſoon learn the cauſe of this difference in the ſtates of iron.

8
This action mutual.

It is ſcarcely neceſſary to remark, that we muſt infer from theſe experiments, that the action is mutual between the two pieces of iron. Either of them may be the moveable piece which approaches the other, manifeſting the attraction of that other. This reciprocity of action will be abundantly verified and explained in its proper place.

9
Not peculiar to magnets or loadſtone;

Theſe two facts were long thought to be peculiar to loadſtones and artificial magnets, that is, pieces of iron which have acquired this property by certain treatment with loadſtones; but they were diſcovered by Dr

Gilbert to be inherent in all iron in its metallic ſtate; and were thought by him to be neceſſary conſequences of a general principle in the conſtitution of this globe. Theſe phenomena are indeed much more conſpicuous in loadſtones and magnets; and it is therefore with ſuch that experiments are beſt made for learning their various modifications.

10
But, in iron, is indifferent, and momentary, and in loadſtones it is fixed and determinate.

But there is another circumſtance, beſides the degree of vivacity, in which the magnetiſm of common iron and ſteel remarkably differs from that of a loadſtone or magnet. When a loadſtone or magnet is ſo ſupported as to be at liberty to take any poſition, it arranges itſelf in the magnetical direction, and *one determined end* of it ſettles in the northern quarter; and if it be placed ſo that the other end is in that ſituation, it does not remain there, but gradually turns round, and, after a few oſcillations, the *ſame end* ultimately ſettles in the north. This is diſtinctly ſeen in the needle of the mariner's compaſs, which is juſt a ſmall magnet prepared in the ſame way with all other magnets. The ſeveral ends of loadſtones or magnets are thus permanently the north or the ſouth ends; whereas we ſaid that either end of a piece of common iron being turned to the northern quarter, it finally ſettles there.

It is this circumſtance which has rendered magnetiſm ſo precious a diſcovery to mankind, by furniſhing us with the compaſs, an inſtrument by which we learn the different quarters of the horizon, and which thus tells the direction of a ſhip's courſe through the pathleſs ocean (ſee Compass and Variation, *Encycl.*); and alſo ſhews us the directions of the veins and workings in the deepeſt mines. It was natural therefore to call thoſe the north and ſouth ends of the mariner's needle, or of a loadſtone or magnet. Dr Gilbert called them the poles of the loadſtone or magnet. He had found it convenient for the propoſed train of his experiments to form his loadſtones into ſpheres, which he called terrellæ, from their reſemblance to this globe; in which caſe the north and ſouth ends of his loadſtones were the poles of the terrellæ. He therefore gave the name *pole* to that part of any loadſtone or magnet which thus turned to the north or ſouth. The denomination was adopted by all ſubſequent writers, and now makes a term in the language of magnetiſm.

11
Poles.

Alſo, when we approach either end of a piece of iron A to either end of another B, theſe ends mutually attract; or if either end of a magnet A be brought near either end of a piece of common iron, they mutually attract each other. But if we bring that end of a magnet A which turns to the north near to the *ſimilar* end of another magnet B, theſe ends will not attract each other, but, on the contrary, will repel. If the two magnets are made to float on pieces of wood, and have their north poles fronting each other, the magnets will retire from each other; and in doing ſo, they generally turn round their axes, till the north pole of one front the ſouth pole of the other, and then they run together. This is a very notable diſtinction between the magnetiſm of magnets and that of common iron; and whenever we ſee a piece of iron ſhew this permanent diſtinction of its ends, we muſt conſider it as a magnet, and conclude that it has met with ſome peculiar treatment.

It is not, however, ſtrictly true, that the poles of loadſtones or magnets are ſo fixed in particular parts of their ſubſtance, nor that the poles of the ſame name ſo conſtantly repel each other; for if a ſmall or weak magnet A have its pole brought near the ſimilar pole of a large or ſtrong magnet B, they are often found to attract when almoſt touching, although at more conſiderable diſtances they repel each other. But this is not an exception to the general propoſition; for when the north pole of A is thus attracted by the north pole of B, it will be found, by other trials, to have all the qualities of a ſouth pole, while thus in the neighbourhood of the north pole of B.

12
Magnetic force and polarity.

The magnetic properties and phenomena are conveniently diſtinguiſhed into thoſe of force and of polarity. Thoſe of the firſt claſs only were known to the ancients, and even of them their knowledge was extremely ſcanty and imperfect. They may all be claſſed under the following general propoſitions.

13
Similar poles repel, and diſſimilar poles attract, each other.

1. The ſimilar poles of two magnets repel each other with a force decreaſing as the diſtances increaſe.
2. The diſſimilar poles of two magnets attract each other with a force decreaſing as the diſtances increaſe.
3. Magnets arrange themſelves in a certain determinate poſition with reſpect to each other.

14
The law of attraction and repulſion is of difficult inveſtigation.

The firſt object of reſearch in our farther examination of theſe properties is the relation which is obſerved to obtain between the diſtances of the acting poles and their force of action. This has accordingly occupied much attention of the philoſophers, and numberleſs experiments have been made in order to aſcertain the law of variation, both of the attraction and the repulſion. A great number of theſe have been narrated in the article Magnetism of the *Encycl.* from which it appears that it has been a matter of great difficulty, and had not been aſcertained with certainty or preciſion when that article was publiſhed. It is obvious, from the nature of the thing, that the determination is very difficult, and the inveſtigation very complicated. We can only obſerve the ſimultaneous motion of the whole magnet; yet we know that there are four ſeparate actions coexiſting and contributing in different directions, and with different forces, to the ſenſible effect. The force which we meaſure, in any way whatever, is compounded of four different forces, which we cannot ſeparate and meaſure apart; for the north pole of A repels the north pole of B, and attracts its ſouth pole, while the ſouth pole of A exerts the oppoſite forces on the ſame poles of B. The attraction which we obſerve is the exceſs of two unequal attractions above two unequal repulſions. The ſame might be ſaid of an obſerved repulſion. Nay, the matter is incomparably more complicated than this; becauſe, for any thing that we know, *every* particle of A acts on *every* particle of B, and is acted on by it; and the intenſity of thoſe actions may be different at the ſame diſtances, and is certainly different when the diſtances are ſo. Thus there is a combination of an unknown number of actions, each of which is unknown individually, both in direction and intenſity. The preciſe determination is therefore, in all probability, impoſſible. By preciſe determination, we mean the law of mutual action between two magnetic particles, or that preciſe function of the diſtance which defines the intenſity of the force; ſo that meaſuring the diſtance of the acting particles on the axis of a curve, the ordinates of the curve may have the proportions of the attractions and repulſions.

It is almoſt needleſs to attempt any deduction of the law of variation from the numerous experiments which have been publiſhed by different philoſophers. An ample collection of them may be ſeen in Scarella's treatiſe. Mr Muſchenbroek has made a prodigious number; but all are ſo anomalous, and exhibit ſuch different laws of diminution by an increaſe of diſtance, that we may be certain that the experiments have been injudicious. Attention has not been paid to the proper objects. Magnets of moſt improper ſhapes have been employed, and of moſt diffuſe polarity. No notice has been taken of a circumſtance which, one ſhould think, ought to have occupied the chief attention; namely, the joint action of four poles, of which the experiment exhibits only the complex reſult. A very ſlight reflection might have made the enquirer perceive, that the attractions or repulſions are not the moſt proper phenomena for declaring the preciſe law of variation; becauſe what we obſerve is only the exceſs of a ſmall difference of attractions and repulſions above another ſmall difference. Mr Hawkſbee and Dr Brook Taylor employed a much better method, by obſerving the deviations from the meridian which a magnet occaſioned in a compaſs needle at different diſtances. This is occaſioned by the difference of the two ſums of the ſame forces; and this difference may be made a hundred times greater than the other. But they employed magnets of moſt improper ſhapes.

15
Judicious experiments by Mr Lambert.

We muſt except from this criticiſm the experiments of Mr Lambert, recorded in the Memoirs of the Academy of Berlin for 1756, publiſhed in 1758. This moſt ſagacious philoſopher (for he highly merits that name) placed a mariner's needle at various diſtances from a magnet, in the direction of its axis, and obſerved the declination from the magnetic meridian produced by the magnet, and the obliquity of the magnet to the axis of the needle. Thus, was the action of the magnet ſet in oppoſition and equilibrium with the natural polarity of the needle. But the difficulty was to diſcover in what proportion each of thoſe forces was changed by their obliquity of action on this little lever. No man excelled Mr Lambert in addreſs in deviſing methods of mathematical inveſtigation. He obſerved, that when the obliquity of the magnet to the axis of the needle was 30°, it cauſed it to decline 15°. When the obliquity was 75°, the diſtance being the ſame, it declined 30°. Call the obliquity o, and the declination d, and let f be that function of the angle which is proportionable to the action. Alſo let p be the natural polarity of the needle, and m the force of the magnet. It is evident that

$$p \times f,\ 15 = m \times f,\ 30$$

And $p : m = f,\ 30 : f,\ 15$; for the ſame reaſon

$$p : m = f,\ 75 : f,\ 30$$

Therefore $f,\ 15 : f\ 30 = f,\ 30 : f,\ 75°$.

But it is well known that

$$\text{Sine } 15 : \text{Sine } 30 = \text{Sine } 30 : \text{Sine } 75.$$

Hence Mr Lambert was led to conjecture, that the ſine was that function of the angle which was proportional to the action of magnetiſm on a lever. But one experiment was inſufficient for determining this point. He made a ſimilar compariſon of ſeveral other obliquities and declinations with the ſame diſtances of the magnet, and alſo with other diſtances; and he put it paſt all diſpute, that his conjecture was juſt.

Had Mr Lambert's experiments terminated here, it muſt be granted that he has made a notable diſcovery in the theory of the intimate nature of magnetiſm. It completely refutes all the theories which pretend to explain the action of a magnet by the impulſion of a ſtream of fluid, or by preſſure ariſing from the motion of ſuch a ſtream: for in this caſe the preſſure on the needle muſt have diminiſhed in the duplicate ratio of the ſine. The directive power with the angle 90 muſt be 4 times greater than with the angle 30°; whereas it was obſerved to be only twice as great. Magnetiſm does not act therefore by the impulſion or preſſure of a ſtream of fluid, but in the manner of a ſimple incitement, as we conceive attraction or repulſion to act.

Having aſcertained the effect of obliquity, Mr Lambert proceeded to examine the effect of diſtance; and, by a moſt ingenious analyſis of his obſervations, he diſcovered, that if we repreſent the force of the magnet by f, and the diſtance of the neareſt pole of the magnet from the centre of the needle by δ, and if a be a conſtant quantity, nearly equal to two-thirds of the length of the needle, we have f proportional to $\overline{\delta - a}^{2}$.

Mr Lambert found this hold with very great exactneſs with magnets ten times larger, and needles twice as ſhort. But he acknowledges, that it gives a very ſingular reſult, as if the action of a magnet were exerted from a centre beyond itſelf. He attributes this to its true cauſe, the ſtill great complication of the reſult, ariſing from the action of the remote pole of the magnet. He therefore takes another method of examination, which we ſhall underſtand by and bye, when we conſider the *directive* power of a magnet. We have mentioned this imperfect attempt chiefly on account of the unqueſtionable manner in which he has aſcertained the effect of obliquity, and the importance of this determination.

We have attempted this inveſtigation in a very ſimple manner. We got ſome magnets made, conſiſting of two balls connected by a ſlender rod. By a very particular mode of impregnation, we gave them a pretty good magnetiſm; and the force of each pole ſeemed to reſide almoſt in the centre of the ball. This was our object in giving them this ſhape. It reduced the examination both of the attractive and of the directive power to a very eaſy computation. The reſult was, that the force of each pole varied in the inverſe duplicate ratio of the diſtance. The error of this hypotheſis in no caſe amounted to $\frac{1}{15}$th of the whole. In computing for the phenomena of the directive power, the irregularities and deviations from this ratio were much ſmaller.

The previous knowledge of this function would greatly expedite and facilitate our farther inveſtigation: but we muſt content ourſelves with a very imperfect approximation, and with arriving at the deſired determination by degrees, and by a very circuitous route.

16
Attempt to explain the phenomena without a preciſe knowledge of this law.

It is a matter of experience, that when two magnets are taken, each of which is as nearly equal as poſſible in the ſtrength of both poles, then, if they are placed with their axes in one ſtraight line, and the north pole of one fronting the ſouth pole of the other, they attract each other with a force which diminiſhes as the diſtance increaſes; and this variation of force is regular, that is, without any ſudden changes of intenſity, till it becomes inſenſible. No inſtance has occurred of its breaking ſuddenly off when of any ſenſible force, but it appears to diminiſh continually like gravity. No inſtance occurs in which attraction is changed into repulſion.

But it is, moreover, to be particularly remarked, that, having made this obſervation with the north pole of A fronting the ſouth pole of B, if the experiment be repeated with the ſouth pole of A fronting the north pole of B, the reſults will be preciſely the ſame. And, laſtly, it is a matter of unexcepted experience, that the ſenſible action of A on B, meaſured by the force which is neceſſary for preventing the farther approach of B, is preciſely equal to the action of B on A. This is the caſe, however unequal the force of the two magnets may be; that is, although A may ſupport ten pounds of iron, and B only ten ounces.

Now, the ſimpleſt view we can take of this experiment is, by ſuppoſing the whole action of one end or pole of a magnet to be exerted at one point of it. This will give us four actions of A on B, accompanied by as many equal and oppoſite actions of B on A. It is plain that we may content ourſelves with the inveſtigation of one only of theſe ſets of actions.

What we obſerve is the exceſs of the attractions of the poles of A for the diſſimilar poles of B above the repulſions of the ſame poles of A for the ſimilar poles of B. At all diſtances there is ſuch an exceſs. The ſum of the attractions exceeds the ſum of the repulſions competent to every diſtance.

Now this will really happen, if we ſuppoſe that the poles of a magnet are of equal ſtrength, and that however theſe different magnets differ in ſtrength, they have the ſame law of diminution by an increaſe of diſtance. The firſt circumſtance is a very poſſible thing, and the laſt is demonſtrated by the obſerved equality of action and reaction. Every thing will now appear very plain, by repreſenting (as we did in ELECTRICITY, *Suppl.* n° 44, &c.) the intenſities of attraction and repulſion by the ordinates of a curve, of which the abſciſſæ repreſent the diſtances of the acting poles.

Therefore let A and B (fig. 2.) repreſent the two magnets, placed with their four poles S, N, s, n, in a ſtraight line. In the ſtraight line O q take O m, O p, O n, O q, reſpectively equal to N s, N n, S s, S n; and let MPNQ be a curve line, having O q for its axis and aſſymptote; and let the curve, in every part, be convex towards its axis. Then draw the ordinates m M, p P, n N, q Q, to the curve. Theſe ordinates will repreſent the intenſities of the forces exerted between the poles of the magnets, in ſuch a manner as to fulfil all the conditions that are really obſerved: For m M repreſents the attraction of the north pole N of the magnet, A for the ſouth pole s of the magnet B; p P repreſents the repulſion of N for n; n N repreſents the repulſion of S for s; and q Q repreſents the attraction of S for n. The diſtance between m and n, or between p and q, is equal to the length of the magnet A, and $m\,p$, or $n\,q$, is equal to that of B. M m, P p, and N n, Q q, are pairs of equidiſtant ordinates. It ſurely requires only the inſpection of the figure to ſee that, in whatever ſituation along the axis we place thoſe pairs of equidiſtant ordinates, the ſum of M m and Q q will always exceed the ſum of P p and N n; that is, the ſum of the attractions will always exceed that of the repulſions. This will not be the caſe if the curve, whoſe ordinates are proportional to the forces, have a point Z of contrary flexure, as is repreſented by the dotted curve $P'ZQ'$. For this curve, having O q for its aſſymptote (in order to correſpond with forces which diminiſh continually by an increaſe of diſtance, but do not abruptly ceaſe) muſt have its convexity turned toward this aſſymptote in the remote parts. But there will be an arch MPZ between Z and O, which is concave toward the aſſymptote. In which caſe, it is poſſible that $\mathrm{M}\,m + \mathrm{Q}\,q$ ſhall be leſs than $\mathrm{P}\,p + \mathrm{N}\,n$; and then the repulſions will exceed the attractions; which is contrary to the whole train of obſervation.

It may be thought, that if the repulſion exerted between two particles be always leſs than the attraction at the ſame diſtance, the phenomena will be accounted for, although the law of action be not repreſented by ſuch a curve as has been aſſumed. Undoubtedly they will, while the diſſimilar poles front each other. But the reſults of ſuch a ſuppoſition will not agree with the phenomena while the ſimilar poles front each other: For it is an uncontradicted fact, that when two fine hard magnets, whoſe poles are nearly or exactly of equal vigour, have their ſimilar poles fronting each other, the repulſions fall very little ſhort of the attractions at the ſame diſtances when their poſition is changed: When the diſtances are conſiderable, ſcarcely any difference can be obſerved in the beginning of the experiment. The differences, alſo, which are obſerved at ſmaller diſtances, are obſerved to augment by continuing the magnets in their places without changing their diſtances; and therefore ſeem to ariſe from ſome change produced by each on the magnetiſm of the other. And, accordingly, if we invert one of the magnets, we ſhall find that the attractions have been diminiſhed as much as the repulſions. Now, the conſequences of magnetic repulſion, being always weaker than attraction, would be the reverſe of this. The differences would appear moſt remarkable in the greater diſtances, and magnets might be found which repel at ſmall diſtances, and attract at greater diſtances; which is contrary to all obſervation.

From all this it follows, with ſufficient evidence for our preſent purpoſe, that the function of the diſtance which expreſſes the law of magnetic action muſt be repreſented by the ordinates of a curve of the hyperbolic kind, referred to its aſſymptote as an axis; and therefore always convex toward this axis. We think it alſo ſufficiently clear, that the conſequences which we have deduced from the ſimple ſuppoſition of four acting points, inſtead of the combined action of every particle, may be adopted with ſafety. For they would be juſt, if there were only thoſe four particles; they would be juſt with reſpect to another four particles—therefore they would be juſt when theſe are joined; and ſo on of any number. Therefore the curve, whoſe ordinates expreſs the mean action of each pole, as if exerted by its centre of effort, will have the ſame general form: It will be convex toward its aſſymptotic axis.

It will greatly aid our conceptions of the combined actions of the four magnetic poles, if we notice ſome of the primary properties of a curve of this kind, limited by no other condition.

17
Unqueſtionable inferences from the phenomena.

Draw the chords MQ, PN, MP, NQ. Biſect them in B, D, E, F, and join EF. Draw the ordinates E e F f, and BD b (cutting EF in C). Draw P u parallel to the axis, cutting E e in ϵ. Draw alſo Q i parallel to the axis, cutting F f in φ. Alſo draw FHL parallel to the axis, and Pot parallel to QN; and draw PLl, and Pex, cutting Mm in l and x.

Let each ordinate be repreſented by the letter at its interſection with the axis. Thus, the ordinates Mm and Qq may be repreſented by m and q, &c.

Becauſe MP is biſected in E, Mt is double of Et; Ml is double of EL; Mx is double of Ee. Alſo, becauſe Pt is parallel to QN, and Pu to Qi, we have $tu = Ni$. From theſe premiſes, it is eaſy to perceive, that,

1. $Bb = \frac{m+q}{2}$.
2. $Db = \frac{p+n}{2}$.
3. $BD = \frac{\overline{m+q} - \overline{p+n}}{2}$.
4. $Mu = m - p$.
5. $ut = n - q$.
6. $Mt = \overline{m-p} - \overline{n-q}$.
7. $Ee = \frac{m+p}{2}$.
8. $Ff = \frac{n+q}{2}$.
9. $Ml = \overline{m+p} - \overline{n+q}$.
10. $EL = \frac{\overline{m+p} = \overline{n+q}}{2}$.
11. $CD = \frac{\overline{m+q} - \overline{p+n}}{4}$.
12. $CH = \frac{\overline{m+p} - \overline{n+n}}{4}$.

Theſe combinations will ſuggeſt to the attentive reader the explanation of many modifications of the combined action of the four poles of two magnets. They are all comprehended in one propoſition, which it will be convenient to render familiar to the thought; namely, if two pairs of equidiſtant ordinates be taken, the ſum of the two extremes exceeds that of the intermediate ones. $m+q$ is greater than $p+n$. Alſo, the difference between the pair neareſt to O exceeds the difference between the remote pair.

Now, conceiving theſe ordinates to repreſent the mutual actions of the magnetic poles, we ſee that their tendency to or from each other, or their ſenſible attractions or repulſions, are expreſſed by $\overline{m+q} - \overline{n+p}$; that is, by the exceſs of the ſum of the actions of the neareſt and moſt remote poles above the ſum of the actions of the intermediate diſtant poles. It will alſo be frequently convenient to conſider this tendency as repreſented by $\overline{m-p} - \overline{n-q}$; that is, by the exceſs of the difference of the actions of the neareſt pole of A on the two poles of B, above the difference of the actions of its remote pole on the ſame poles of B.

Let us now conſider ſome of the chief modifications of theſe actions.

18 Explanation of the obſerved attraction of magnets,

1. Let the diſſimilar poles front each other. It is plain that $m+q$ repreſent attractions, and that $p+n$ repreſent repulſions. Alſo $m+q$ is greater than $p+n$. Therefore the magnets will attract each other. This attraction is alſo repreſented by $\overline{m-p} - \overline{n-q}$.

Now $\overline{m+q} - \overline{p+n}$ is evidently equal to Mt, or to twice Eo, or to twice BD, or to four times CD.

This action will be increaſed,

1. By increaſing the ſtrength of either of the magnets. The action of the magnets is the combined action of each acting particle of the one on each acting particle of the other; and it is mutual. Therefore all the ordinates will increaſe in the ratio of the ſtrength of each magnet, and their ſums and differences will increaſe in the ſame ratio.

2. By diminiſhing the diſtance between the magnets. For this brings all the ordinates nearer to O, while their diſtances mp, pn, nq, remain as before. In this caſe it is plain, that Mu, the difference of Mm and Pp, will increaſe faſter than tu or Ni, the difference between Nn and Qq. Therefore Mt will increaſe; that is, the attraction will increaſe.

3. By increaſing the length of A, while the diſtance between them remains the ſame. For Om remaining the ſame, as alſo mp and nq, while nq is only removed farther from mp, it is plain Mu remains the ſame, and that Ni and tu are diminiſhed; therefore Mt muſt increaſe, or the attraction muſt increaſe.

4. By increaſing the length of B, the diſtance between them remaining the ſame. For this increaſes mp and nq; and conſequently increaſes Mu and tu. But Mu increaſes more than tu; and therefore Mt is increaſed, and the attraction or tendency is increaſed.

All theſe conſequences of our original ſuppoſition, that the magnetic action may be repreſented by the ordinates of a curve every where convex to an aſſymptotic axis, are ſtrictly conformable to obſervation.

19 And of their repulſions.

If we place the magnets with their ſimilar poles fronting each other, it is evident that the ordinates which expreſſed attractions in the former caſe, will now expreſs repulſions; and that the forces with which the magnets now repel each other, are equal to thoſe with which they attracted when at the ſame diſtances. When the experiments are made with good loadſtones, or very fine magnets, tempered extremely hard, and having the energy of their poles ſenſibly reſiding in a ſmall ſpace very near the extremities, the reſults are alſo very nearly conformable to this mathematical theory; but there is generally a weaker action. The magnets ſeldom repel as ſtrongly as they attract at the ſame diſtance; at leaſt when theſe diſtances are ſmall. If one or both of the magnets is ſoft, or if one of them be much more vigorous than the other, there are obſerved much greater deviations from this theory. The repulſions are *conſiderably* weaker than the attractions at the ſame diſtance, and the law of variation becomes extremely different. When placed at very conſiderable diſtances, they repel. As the magnet B is brought nearer to A, the repulſion increaſes, agreeably to the theory, but not ſo faſt. Bringing them ſtill nearer, the repulſion ceaſes to increaſe, then gradually diminiſhes, and frequently vaniſhes altogether, before the magnets are in contact: and when brought ſtill nearer, it is changed into attraction.

20 Seeming exceptions obviated.

But more careful obſervation ſhews, that this anomaly does not invalidate the theory. It is found that the vigour of the magnets is permanently changed by this proceſs. The magnets act on each other in ſuch a way as to weaken each other's magnetiſm. Nay, it frequently happens, that the weaker or the ſofter of the two has had its magnetiſm changed, and that the pole neareſt to the other has changed its nature. While they are lying in contact, or at ſuch a diſtance that they attract, although their ſimilar poles front each other, it is found that the pole of one of them is really changed; although it may ſometimes recover its former ſpecies again, but never ſo vigorouſly as when the other magnet is removed. In ſhort, it is obſerved, that the magnetiſm is diminiſhed in all experiments in which the magnets repel each other, and that it is improved in all experiments in which they attract.

We have hitherto ſuppoſed the magnets placed with their axes in one ſtraight line. If they are differently placed, we cannot aſcertain by this ſingle circumſtance of the law of magnetic action, whether they will attract or repel—we muſt know ſomewhat more of the variation of force by a change of diſtance.

21 DIRECTIVE POWER explained.

If the magnet B be not at liberty to approach toward A, or recede from it, but be ſo ſupported at its centre B that it can turn round it, it is very plain that it will retain the poſition in which it is drawn in the figure. For its ſouth pole s being more attracted by N than it is repelled by S, is, on the whole, attracted by the magnet A; and, by this attraction, it would vibrate like a pendulum that is ſupported at the centre B. In like manner, its north pole n is more repelled by N than it is attracted by S, and is, on the whole, repelled. The part B n would therefore alſo vibrate like a pendulum round B. Thus each half of it is urged into the very poſition which it now has; and if this poſition be deranged a little, the attraction of s B toward A, and the repulſion of n B from it, would impel it toward the poſition s B n.

This will be very evident, if we put the magnet B into the poſition s'Bn', at right angles to the line AB. The pole s' and the pole n' are urged in oppoſite, and therefore conſpiring, directions with equal forces, very nearly at right angles to $n's'$, if the magnet B be ſmall. In any oblique poſition, the forces will be ſomewhat unequal, and account muſt be had of the obliquity of the action, in order to know the preciſe rotative momentum of the actions.

Dr Gilbert has given to this modification of the action of A on B, the name of VIS DISPONENS; which we may tranſlate by DIRECTIVE POWER OR FORCE. Alſo, that modification of the tendency of B to or from A is called by him the VERTICITAS of B. We might call it the VERTICITY of B; but we think that the name POLARITY is ſufficiently expreſſive of the phenomenon; and as it has come into general uſe, we ſhall abide by it.

22 Its meaſure.

It is not ſo eaſy to give a general, and at the ſame time preciſe, meaſure of the directive power of A and polarity of B. The magnet B muſt be conſidered as a lever; and then the force tending to bring it into its ultimate poſition $n s$ depends both on the diſtance of its poles from N and S, and alſo on the angle which the axis of B makes with the line AB. When the axis of B coincides with AB, the force acting on its poles, tending to *keep* them in that ſituation, is evidently $m + p - \overline{n + q}$, and therefore may be repreſented by M l (in fig. 2.), or by twice EL, or by four times CH. If B has the poſition n'Bs', perpendicular to AB, let the ordinates E e and F f cut the curve on I and K; and draw KL parallel to the axis (our figure cauſes this line almoſt to coincide with QL, and in all important caſes it will be nearly the ſame). In this caſe IL will expreſs one half of this force. Either of theſe eſtimations of this modification of the mutual action of the magnets, will be ſufficient for the objects we have in view.

23 How increaſed and diminiſhed.

The directive power of A, and the polarity of B, are increaſed,

1. By increaſing the ſtrength of one or both of the magnets. This is evident,

2. By diminiſhing the diſtance of the magnets. For this, by increaſing the ſum of M m and P p more than the ſum of N n and Q q, muſt increaſe EL or M l.

3. By increaſing the length of A. For this, by removing n and q farther from m and p, muſt depreſs the points L and l, and increaſe EL, or IL, or M l.

4. By diminiſhing the length of B, while the diſtance N s between the magnets remains the ſame. For this, by bringing p and q nearer to m and n, muſt increaſe $\mathrm{M}m + \mathrm{P}p$ more than $\mathrm{N}n + \mathrm{Q}q$. Or, by bringing E e and F f nearer to M m and N n, it muſt increaſe EL and M l.

If the diſtance N n between the pole of A and the remote pole of B remain the ſame, the directive force of A, and polarity of B, are diminiſhed by diminiſhing the length of B, as is eaſily ſeen from what has been juſt now ſaid. It is alſo diminiſhed, but in a very ſmall degree, by diminiſhing the length of B, when the diſtance between the centres of A and B remain the ſame. For, in this caſe, the ordinates I e and K f retain their places; but the points m and p approach to e; and this brings the interſection E of the ordinate and chord nearer to I, and diminiſhes EL, becauſe the point L is not ſo much depreſſed by the approach of F to K as E is depreſſed.

24 Circumſtances affecting the proportion of the attractive and directive powers.

But in all caſes, the *ratio* of the directive power of A to its attractive force, or of the polarity of B to its tendency to A, is increaſed by diminiſhing the length of B. For it is plain, that by diminiſhing $m p$ and $n q$, while I e and K f keep their places, the point o is raiſed, and the point L is depreſſed; and therefore the ratio of EL to E o, or of M l to M t, is increaſed. We even ſee that, by diminiſhing the length of B continually and without end, the ratio of M l to M t may be made to exceed any ratio that can be aſſigned.

25 The polarity of a ſmall magnet may be great while the attraction is inſenſible.

Now, ſince diminiſhing the length of B increaſes the ratio of the directive power of A to its attractive power, while increaſing the length of A increaſes both, and alſo increaſes the ratio of EL to E o (as is very eaſily ſeen), and ſince this increaſe may be as great as we pleaſe, it neceſſarily follows, that if the ſame very ſmall magnet B be placed at ſuch diſtances from a large and ſtrong magnet A, and from a ſmaller and leſs vigorous one C, as to have equal polarities to both, its tendency to A will be leſs than its tendency to C. It may even be leſs in any ratio we pleaſe, by ſufficiently diminiſhing the length of B.

Dr Gilbert obſerved this; and he expreſſes his obſervation by ſaying, that the directive power extends to greater diſtances than the attracting power. We muſt juſt conclude, that the laſt becomes *inſenſible* at ſmaller diſtances than the firſt. This will be found a very important obſervation. It may be of uſe to keep in mind, that the directive power of a magnet A on another magnet B, is the difference of the *ſums* of the actions of each pole of A on both poles of B; and the attractive power of A for another magnet B, is the difference of the *differences* of theſe actions.

It may be alſo remarked juſt now, that the directive force of A always exceeds its attractive force by the quantity $2\,(p-q)$. For their difference may be expreſſed by tl, which is equal to twice oL. Now ιe is equal to Pp, or to p; and ιL is equal to $Pp - Ff$, or to $Pp - Qq - F\varphi$, or to $Pp - Qq - o\iota$. Therefore $oL = Pp - Qq$, and $tl = 2\,(Pp - Qq)$, $= 2\,(p-q)$.

By inſpecting this figure with attention, we obtain indications of many intereſting particulars. If the lengths of the magnets A and B are the ſame, the point n in the axis of the curve will coincide with p. As the length of A increaſes, the part nq is removed farther from the part mp. The line Pt becomes leſs inclined to the axis, and is ultimately parallel to it, when n is infinitely remote. At this time L falls on e; ſo that the ultimate ratio of the attraction to the polarity is that of $E\iota$ to Ee, when the magnet A is infinitely long. It is then the ratio of the difference of the actions of the neareſt pole of A on the two poles of B to the ſum of theſe actions. Hence it follows, that when A is very great and B very ſmall, the polarity of B is vaſtly greater than its tendency to A. It may have a great polarity when its tendency is inſenſible.

The ratio of the polarity to the attraction alſo increaſes by increaſing the diſtance of the magnets while their dimenſions continue the ſame. This will appear, by remarking that the chords MP and NQ muſt interſect in ſome point w; and that when the four points m, p, n, and q, move off from O, keeping the ſame diſtances from each other, Eo will diminiſh faſter than EL, and the ratio of EL to EO will continually increaſe.

Therefore when a ſmall magnet B is placed at ſuch a diſtance from a great magnet A, and from a ſmaller one C, as to have equal polarity to both, its tendency to C will exceed its tendency to A. For the polarities being equal, it muſt be farther from the great magnet; in which caſe the ratio of its polarity to its attraction is increaſed.

And this will alſo obtain if the magnets differ alſo in ſtrength. For, to have equal polarities, B muſt be ſtill farther from the great and powerful magnet.

For all theſe reaſons, a large and powerful magnet may exert a ſtrong directive power, while its attractive power is inſenſible.

26
Peculiarities of oblique poſitions of two magnets.

We have hitherto ſuppoſed the magnet B to be placed in the direction of the axis of A, and only at liberty to turn round its centre B. But let its centre be placed on the centre of A, as in fig. 3. it muſt evidently take a poſition which may be called ſubcontrary to that of A, the north pole of B turning toward the ſouth pole of A, and its ſouth pole turning toward the north pole of A.

The ſame thing muſt happen when the centre of B is placed in B, any where in the line AE perpendicular to NS. S attracts n with a force nb, while N repels n with a force no, ſomewhat ſmaller than nb. Theſe two compoſe the force nd. In like manner, the two forces se and sf, exerted by N and S on the pole s, compoſe the force sq. Now if the axis of the magnet B be parallel to NS, but the poles in a contrary poſition, and if each magnet be equally vigorous in both poles, the magnet B will retain this poſition; becauſe the forces nb and se are equal, as alſo the forces nc and sf. Theſe muſt compoſe two forces nd and sq, which are equal, and equally inclined to ns; and they will therefore be in equilibrio on this lever.

Let us now place the centre of the ſmall magnet in C, neither in the axis of the other, nor in the perpendicular AE. Let its north pole n point toward the centre of A. It cannot remain in this poſition; for N repels n with a force nc, while S attracts it with a force nb (ſmaller than nc, becauſe the diſtance is greater). Theſe two compoſe a force nd conſiderably different from the direction cn of its axis. In like manner, the ſouth pole s of the ſmall magnet is acted on by two forces se and sf, exerted by the two poles of A, which compoſe a force sq nearly equal and parallel to nd, but in a nearly oppoſite direction. It is plain that theſe forces muſt turn the ſmall magnet round its centre C, and that it cannot reſt but in a poſition nearly parallel to nd or sf. Its poſition is better repreſented by fig. 4. with its ſouth pole turned toward the north pole of the other magnet, and its north pole in the oppoſite direction.

What the preciſe poſition will be, depends on that function of the diſtance which is always proportional to the intenſity of the action; on the force of each of the poles of A, and on the length of the magnet B. Nay, even when we know this function, the problem is ſtill very intricate.

27
Means of acquiring a near meaſure of the law of action.

There are methods by which we may approximate to the function with ſucceſs. If the magnet B be indefinitely ſmall, ſo that we may conſider the actions on its two poles as equal, the inveſtigation is greatly ſimplified. For, in this caſe, each pole of the ſmall magnet B (fig. 5.) may be conceived as coinciding with its centre. Then, drawing NB, SB, and taking Bb toward N, to repreſent the force with which N attracts the ſouth pole of B, and taking Bc, in SB produced, to repreſent the force with which S repels the ſame pole, the compound force acting on this pole is Bd, the diagonal of a parallelogram Bb, dc. In like manner, we muſt take Be, in Nb produced, and equal to Bb, to repreſent the repulſion of N for the north pole of B, and Bf equal to Bc, to repreſent the attraction of S for this pole. The compound force will be Bg, equal and oppoſite to Bd. It follows evidently from this inveſtigation, that the ſmall magnet will not reſt in any poſition but dg. In this ſuppoſition, therefore, of extreme minuteneſs of the magnet B, one of the parallelograms is ſufficient. We may farther remark, that we have this approximation ſecure againſt any error ariſing from the ſuppoſition that all the action of each pole of B is exerted by one point. Although we ſuppoſe it diffuſed over a conſiderable portion of the magnet, ſtill the extreme minuteneſs of the whole makes the action, even on its extreme points, very nearly equal.

28
Law of action inveſtigated—MAGNETIC CURVE.

Hence may be derived a conſtruction for aſcertaining the poſition of the needle, when the function m of the diſtance is given, or for diſcovering this function by obſervation of the poſition of the needle.

Let NS (fig. 5. n° 2) meet the direction of the needle in K. Make $BG = BN$, and draw NF, GE, SH, perpendicular to BK. It is evident that Bb is to Bc, or bd, as the ſine of the angle HBS to the ſine of KBN. Therefore, becauſe BG and BN are equal, we have $Bb : Bc = GE : NF$.

Therefore $GE : NF = BS^m : BN^m$
But $SH : GE = BS : BN$
Therefore $SH : NF = BS^{m+1} : BN^{m+1}$
And $SK : NK = BS^{m+1} : BN^{m+1}$

If magnetic action be inverſely as the diſtance, we have $SK : NK = BS^2 : BN^2$, and B is in the circumference of a circle which paſſes through S and N, and has BK for a tangent, as is plain by elementary geometry. If the action be inverſely as the ſquare of the diſtance, we have $SK : NK = BS^3 : BN^3$, and B is in the circumference of a curve of more difficult inveſtigation. But, as in the circle, the ſum of the angles BSN and BNS is a conſtant angle; ſo, in this curve, the ſum of the coſines of thoſe angles is a conſtant quantity. This ſuggeſts a very ſimple conſtruction of the curve. Let it paſs through the point T of the line AT, drawn from the centre of the magnet, perpendicular to its axis. Deſcribe the ſemicircle SPQN, cutting ST and NT in P and Q. Then, in order to find the point where any line SB cuts the curve, let it cut the ſemicircle in p, and apply the line $Nq = SP + NQ - Sp$, and produce it till it meet the line SB in B, which is a point in the curve; for it is evident that Sp and Nq are the coſines of BSN and BNS. We hope to give, by the help of a learned friend, the complete conſtruction of curves for every value of *m*, in an Appendix to this article. It will form a new and curious claſs, arranged by the functions of the angles at N and S.

But, in the mean time, we have determined the poſition of an indefinitely ſmall needle, in reſpect of a magnet of which we may conceive the polar activity concentrated in two points; and we may, on the other hand, make uſe of the obſerved poſitions of ſuch a needle and magnet for diſcovering the value of *m*. For, ſince $\frac{SK}{NK} = \frac{SB^{m+1}}{NB^{m+1}}$, it is plain that $m = \frac{\text{Log. } SK : NK}{\text{Log. } SB : NB} - 1$. Thus, in an obſervation which the writer of this article made on a very ſmall needle, and a magnet having globular poles, and $8\frac{1}{8}$ inches between their centres, he found $SB = 5\frac{1}{3}$, $NB = \frac{1}{3}$, $SK = 11{,}49$, and $NK = 3{,}37$. This gives $m = 1{,}97$, which differs from 2 only $\frac{1}{60}$th part. Finding it ſo very near the inverſe duplicate ratio of the diſtance, a circle VUZ was deſcribed, the circumference of which is the locus of $SB : BN = 8 : 5{,}333$. When the centre of the needle was placed anywhere in the circumference of this circle, it ſcarcely deviated from the point K, except when ſo far removed from the magnet that its natural polarity prevailed over the directive power of the magnet, or ſo near its middle that the action of the cylindrical part became very ſenſible.

It is plain that the length of the needle muſt occaſion ſome deviation from the magnetic direction, by deſtroying the perfect equality of action on its two poles. He therefore employed three needles of $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ of an inch in length; and by noticing the differences of direction, he inferred what would be the direction, if the forces on each pole were preciſely equal. He had the pleaſure of ſeeing that the deviation from the inverſe duplicate ratio of the diſtances was ſcarcely perceptible.

Mr Lambert's experiments on the directive power of the magnet, narrated in his ſecond diſſertation in the 22d volume of the Memoirs of the Academy of Berlin, are the moſt valuable of all that are on record; and the ingenious addreſs with which they are conducted, and the inferences are drawn, would have done credit to Newton himſelf. We earneſtly recommend the careful peruſal of that Eſſay, as the moſt inſtructive of any that we have read. The writer of this found himſelf obliged to repeat all his former experiments, mentioned above, in Mr Lambert's manner, and with his precaution of keeping the needle in its natural poſition; a circumſtance to which he had not ſufficiently attended before. The new reſults were ſtill more conformable to his conjecture as to the law of variation. Mr Lambert cloſes his diſſertation with an hypotheſis, "that the force of each tranſverſe element of a magnet is as its diſtance from the centre, and its action on a particle of another magnet is inverſely as the ſquare of the diſtance." On this ſuppoſition, he calculates the poſition of a very ſmall needle, and draws three of the curves to which it ſhould be the tangent. Theſe are very exactly coincident with ſome that he obſerved. We tried this with ſeveral magnetic bars, and found it very conformable to obſervation in ſome magnets; but deviating ſo far in the caſe of other magnets, that we are convinced that there is no rule for the force of each tranſverſe element of a magnet, and that the magnetiſm is differently diſpoſed in different magnets. It was chiefly this which induced us to form the magnets employed in this reſearch of two balls united by a ſlender rod. Lichtenberg, in his notes on Erxleben's Natural Philoſophy, ſays, that there is a MS. of the celebrated Tobias Mayer in the library of the Academy of Gottingen, in which he aſſumes the hypotheſis above-mentioned, and gives a conſtruction of the magnetic curves founded on it, making them a kind of catenaria. The interior curves do indeed reſemble the catenaria, but the exterior are totally unlike. But there is no occaſion for much argument to convince us, that the firſt part of this hypotheſis is not only gratuitous, but unwarranted by any general phenomena. We know that a magnetical bar may have its magnetiſm very differently diſpoſed; for it may have more than two poles, and the intermediate poles *cannot* have this diſpoſition of the magnetiſm. Such a diſpoſition is perhaps poſſible; but is by no means general, or even frequent. We are diſpoſed to think, that permanent magnetiſm muſt have its intenſity diminiſhing in the very extremity of the bar. The reader may gueſs at our reaſons from what is ſaid in ELECTRICITY, *Suppl.* n° 222.

29
PRIMARY and SECONDARY, or SIMPLE and COMPOUND curves.

The following very curious and inſtructive phenomenon was the firſt thing which greatly excited the curioſity of the writer of this article, and long puzzled him to explain it. Indeed it was his endeavours to explain it, which gradually opened up to him the theory of the mutual action of magnets contained in theſe paragraphs, and firſt gave him occaſion to admire the ſagacity of Dr Gilbert, and to ſee the connecting principle of the vaſt variety of obſervations and experiments which that philoſopher had made. It ſeems owing to the want of this connecting principle, that a book ſo rich in facts ſhould be ſo little read, and that ſo many of Dr Gilbert's obſervations have been publiſhed by others as new diſcoveries.

Amuſing himſelf in the ſummer 1758 with magnetic experiments, two large and ſtrong magnets A and B (fig. 6.), were placed with their diſſimilar poles fronting each other, and about three inches apart. A ſmall needle, ſupported on a point, was placed between them at D, and it arranged itſelf in the ſame manner as the great magnets. Happening to ſet it off to a good diſtance on the table, as at F, he was ſurpriſed to ſee it immediately turn round on its pivot, and arrange itſelf nearly in the oppoſite direction. Bringing it back to D reſtored it to its former poſition. Carrying it gradually out along DF, perpendicular to NS, he obſerved it to become ſenſibly more feeble, vibrating more ſlowly; and when in a certain point E, it had no polarity whatever towards A and B, but retained any poſition that was given it. Carrying it farther out, it again acquired polarity to A and B, but in the oppoſite direction; for it now arranged itſelf in a poſition that was parallel to NS, but its north pole was next to N, and its ſouth pole to S.

This ſingular appearance naturally excited his attention. The line on which the magnets A and B were placed had been marked on the table, as alſo the line DF perpendicular to the former. The point E was now marked as an important one. The experiments were interrupted by a friend coming in, to whom ſuch things were no entertainment. Next day, wiſhing to repeat them to ſome friends, the magnets A and B were again laid on the line on which they had been placed the day before, and the needle was placed at E, expecting it to be neutral. But it was found to have a conſiderable verticity, turning its north pole toward the magnet B; and it required to be taken farther out, toward F, before it became neutral. While ſtanding there, ſomething chanced to joggle the magnets A and B, and they inſtantly ruſhed together. At the ſame inſtant, the little magnet or needle turned itſelf briſkly, and arranged itſelf, as it had done the day before, at F, quivering very briſkly, and thus ſhewing great verticity. This naturally ſurpriſed the beholders; and we now found that, by gradually withdrawing the magnets A and B from each other, the needle became weaker—then became neutral—and then turned round on its pivot, and took the contrary poſition. It was very amuſing to obſerve how the ſimply ſeparating the magnets A and B, or bringing them together, made the needle aſſume ſuch a variety of poſitions and degrees of vivacity in each.

The needle was now put in various ſituations, in reſpect to the two great magnets: namely, off at a ſide, and not in the perpendicular DF. In theſe ſituations, it took an inconceivable variety of poſitions, which could not be reduced to any rule; and in moſt of them, it required only a motion of one of the great magnets for an inch or two, to make the needle turn briſkly round on its pivot, and aſſume a poſition nearly oppoſite to what it had before.

But all this was very puzzling, and it was not till after ſeveral months, that the writer of this article, having conceived the notion of the magnetic curves, was in a condition to explain the phenomena. With this aſſiſtance, however, they are very clear, and very inſtructive.

Nothing hinders us from ſuppoſing the magnets A and B perfectly equal in every reſpect. Let NHM, NEL, be two magnetic curves belonging to A; that is, ſuch that the needle arranges itſelf along the tangent of the curve. Then the magnet B has two curves SGK, SEI, perfectly equal, and ſimilar to the other two. Let the curves NHM and SGK interſect in C and F. Let the curves NEL and SEI touch each other in E.

The needle being placed at C, would arrange itſelf in the tangent of the curve KGS, by the action of B alone, having its north pole turned toward the ſouth pole S of B. But, by the action of A alone, it would be a tangent to the curve NHM, having its north pole turned away from N. Therefore, by the combined action of both magnets, it will take neither of theſe poſitions, but an intermediate one, nearly biſecting the angle formed by the two curves, having its north pole turned toward B.

But remove the needle to F. Then, by the action of the magnet A, it would be a tangent to the curve FM, having its north pole toward M. By the action of B, it would be a tangent to the curve KFG, having its north pole in the angle MFG, or turned toward A. By their joint action, it takes a poſition nearly biſecting the angle GFM, with its north pole toward A.

Let the needle be placed in E. Then, by the action of the magnet A, it would be a tangent to the curve NEL, with its north pole pointing to F. But, by the action of B, it will be a tangent to SEI, with its north pole pointing to D. Theſe actions being ſuppoſed equal and oppoſite, it will have no verticity, or will be neutral, and retain any poſition that is given to it.

The curve SEI interſects the curve NHM in P and Q. The ſame reaſoning ſhews, that when the needle is placed at P, it will arrange itſelf with its north pole on the angle SPH: but, when taken to Q, it will ſtand with its north pole in the angle EQM.

From theſe facts and reaſonings we muſt infer, that, for every diſtance of the magnets A and B, there will be a ſeries of curves, to which the indefinitely ſhort needle will always be a tangent. They will riſe from the adjoining poles on both ſides, croſſing diagonally the lozenges formed by the PRIMARY or SIMPLE curves, as in fig. 6. Theſe may be called COMPOUND or SECONDARY magnetic curves. Moreover, theſe ſecondary curves will be of two kinds, according as they paſs through the firſt or ſecond interſections of the primary curves, and the needle will have oppoſite poſitions when placed on them. Theſe two ſets of curves will be ſeparated by a curve GEH, in the circumference of which the needle will be neutral. This curve paſſes through the points where the primary curves touch each other. We may call this the *line of neutrality* or inactivity.

We now ſee diſtinctly the effect of bringing the magnets A and B nearer together, or ſeparating them farther from each other. By bringing them nearer to each other, the point E, which is now a point of neutrality, may be found in the *ſecond* interſection (ſuch as F) of two magnetic curves, and the needle will take a ſubcontrary poſition. By drawing them farther from each other, E may be in the *firſt* interſection of two magnetic curves, and the needle will take a poſition ſimilar to that of C.

If the magnets A and B are not placed ſo as to form a ſtraight line with their four poles, but have their axes making an angle with each other, the contacts and interſections of their attending curves may be very different from thoſe now repreſented; and the poſitions of the needle will differ accordingly. But it is plain, from what has been ſaid, that if we knew the law of action, and conſequently the form of the primary curves, we ſhould always be able to ſay what will be the poſition of the needle. Indeed, the conſideration of the ſimple curves, although it was the mean of ſuggeſting to the writer of this article the explanation of thoſe more complicated phenomena, is by no means neceſſary for this purpoſe. Having the law of magnetic action, we muſt know each of the eight forces by which the needle is affected, both in reſpect of direction and intenſity; and are therefore able to aſcertain the ſingle force ariſing from their compoſition.

Secondary curves of repulſion.

When the ſimilar poles of A and B are oppoſed to each other, it is eaſy to ſee, that the poſition of the needle muſt be extremely different from what we have been deſcribing. When placed anywhere in the line DF, between two magnets, whoſe north poles front each other in N and S, its north pole will always point away from the middle point D. There will be no neutral point E. If the needle be placed at P or Q, its north pole will be within the angle EPH, or FQI. This poſition of the magnets gives another ſet of ſecondary curves, which alſo croſs the primary curves, paſſing diagonally through the lozenges formed by their interſection. But it is the other diagonal of each lozenge which is a chord to thoſe ſecondary curves. They will, therefore, have a form totally different from the former ſpecies.

30
Remarks on this inveſtigation.

The conſideration of this compounded magnetiſm is important in the ſcience, both for explaining complex phenomena, and for advancing our knowledge of the great deſideratum, the law of magnetic action. It ſerves this purpoſe remarkably. By employing a very ſmall needle, the points of neutrality aſcertain very nearly where the magnetic curves have a common tangent, and ſhews the poſition of this tangent. By placing the two magnets ſo as to form various angles with each other, we can, by means of theſe neutral points, know the poſition of the tangent in every point of the curve, and thus can aſcertain the form of the curve, and the law of action, with conſiderable accuracy. The writer of this article took this method; and the reſult confirmed him in the opinion, that it was in the inverſe duplicate ratio of the diſtances. The chief (perhaps the only) ground of error ſeemed to be the difficulty of procuring large magnets, having the action of each pole very much concentrated. Large magnets muſt be employed. He attempted to make ſuch, conſiſting of two ſpherical balls, joined by a ſlender rod. But he could not give a ſtrong magnetiſm to magnets of this form, and was forced to make uſe of common bars, the poles of which are conſiderably diffuſed. This diffuſion of the pole renders it very difficult to ſelect with propriety the points from which the diſtances are to be eſtimated, in the inveſtigation of the relation between the forces and diſtances.

He tried another method for aſcertaining this ſo much deſired law, which had alſo the ſame reſult. Having made a needle conſiſting of two balls joined by a ſlender rod, and having touched it with great care, ſo that the whole ſtrength of its poles ſeemed very little removed from the centres of the balls, he counted the number of horizontal vibrations which it made in a given time by the force of terreſtrial magnetiſm. He then placed it on the middle of a very fine and large magnet, placed with its poles in the magnetic meridian, the north pole pointing ſouth. In this ſituation he counted the vibrations made in a given time. He then raiſed it up above the centre of the large magnet, till the diſtance of its poles from thoſe of the great magnet were changed in a certain proportion. In this ſituation its vibrations were again counted. It was tried in the ſame way in a third ſituation, conſiderably more remote from the great magnet. Then, having made the proper reduction of the forces correſponding to the obliquity of their action, the force of the poles of the great magnet was computed from the number of vibrations. To ſtate here the circumſtances of the experiment, the neceſſary reductions, and the whole computations, would occupy ſeveral pages, and to an intelligent reader would anſwer little purpoſe. Mr Lambert's excellent diſſertation in the 22d vol. of the *Mem. de l'Acad. de Berlin*, will ſhew the prolixity and intricacy of this inveſtigation. Suffice it to ſay, that theſe experiments were the moſt conſiſtent with each other of any made by the writer of this article, with the view of aſcertaining the law of magnetic action; and it is chiefly from their reſult that he thinks himſelf authoriſed to ſay, with ſome confidence, that it is inverſely as the ſquare of the diſtance. Theſe experiments were firſt made in a rough way in 1769 and 1770. In 1775, obſerving that Mr Æpinus ſeemed to think the action inverſely as the diſtance (ſee his *Tentam. Theor. Electr. et Magn.* § 301. &c.), they were repeated with very great care; and to theſe were added another ſet of experiments, made with the ſame magnet and the ſame needle, placed not above the magnet, but at one ſide (but always in the line through the centre, perpendicular to the axis, ſo that the actions of the two poles might be equal). This diſpoſition evidently ſimplifies the proceſs exceedingly. The reſult of the whole was ſtill more ſatisfactory. This concluſion is alſo confirmed by the experiments of Mr Coulomb in the Memoirs of the Academy of Sciences at Paris for 1786 and 1787. It would ſeem therefore to be pretty well eſtabliſhed. Another method, which ſeems ſuſceptible of conſiderable accuracy, ſtill remains to be tried. It will be mentioned in due time.

Such then are the general laws obſerved in the mutual action of magnets. We think it ſcarcely neceſſary to enter into a farther detail of their conſequences, correſponding to the innumerable varieties of poſitions in which they may be placed with reſpect to each other. We are confident, that the ſenſible actions will always be found agreeable to the legitimate conſequences of the general propoſitions which we have eſtabliſhed in the preceding paragraphs. We proceed therefore to conſider ſome phyſical facts not yet taken notice of, which have great influence on the phenomena, and greatly aſſiſt us in our endeavours to underſtand ſomething of their remote cauſe.

31
Magnetiſm is temporary and periſhing.

Magnetiſm, in all its modifications of attraction, repulſion, and direction, is, in general, of a temporary or periſhing nature. The beſt loadſtones and magnets, unleſs kept with care, and with attention to certain circumſtances, are obſerved to diminiſh in their power. Natural loadſtones, and magnets made of ſteel, tempered as hard as poſſible, retain their virtue with greateſt obſtinacy, and ſeldom loſe it altogether, unleſs in ſituations which our knowledge of magnetiſm teaches us to be unfavourable to its durability. Magnets of tempered ſteel, ſuch as is uſed for watch-ſprings, are much ſooner weakened, part with a greater proportion of their force by ſimple keeping, and finally retain little or none. Soft ſteel and iron loſe their magnetiſm almoſt as ſoon as its producing cauſe is removed, and cannot be made to retain any ſenſible portion of it, unleſs their metallic ſtate ſuffer ſome change.

1. Hurt by improper poſition.

1. Nothing tends ſo much to impair the power of a magnet as the keeping it in an improper poſition. If its axis be placed in the magnetic direction, but in a contrary poſition, that is, with the north pole of it where the ſouth pole tends to ſettle, it will grow weaker from day to day; and unleſs it be a natural loadſtone, or be of hard tempered ſteel, it will, after no very long time, loſe its power altogether.

2. By heat; effects of thunder and electricity.

2. This diſſipation of a ſtrong magnetic power is greatly promoted by heat. Even the heat of boiling water affects it ſenſibly; and if it be made red hot, it is entirely deſtroyed. This laſt fact has long been known. Dr Gilbert tried it with many degrees of violent heat, and found the conſequences as now ſtated; but having no thermometers in that dawn of ſcience, he could not ſay any thing preciſe. He only obſerves, that it is deſtroyed by a heat not ſufficient to make it viſible in a dark room. Mr Canton found even boiling water to weaken it; but on cooling again the greateſt part was recovered.

3. By violent treatment.

3. What is more remarkable, magnetiſm is impaired by any rough uſage. Dr Gilbert found, that a magnet which he had impregnated very ſtrongly, was very much impaired by a ſingle fall on the floor; and it has been obſerved ſince his time, that falling on ſtones, or receiving any concuſſion which cauſes the magnet to ring or ſound, hurts it much more than beating it with any thing ſoft and yielding. Grinding a natural loadſtone with coarſe powders, to bring it into ſhape, weakens it much; and loadſtones ſhould therefore be reduced into a ſhape as little different from their natural form as poſſible; and this ſhould be done briſkly, cutting them with the thin diſks of the lapidary's wheel, cutting off only what is neceſſary for leaving their moſt active parts or poles as near their extremities as we can.

All theſe cauſes of the diminution of magnetiſm are more operative if the magnet be all the while in an improper poſition.

4. By other magnets.

4. Laſtly, magnetiſm is impaired and deſtroyed by placing the magnet near another magnet, with their ſimilar poles fronting each other. We have had occaſion to remark this already, when mentioning the experiments made with magnets in this poſition, for aſcertaining the general laws or variations of their repulſion. We there obſerved, that magnets ſo ſituated always weakened each other, and that a powerful magnet often changed the ſpecies of the neareſt pole of one leſs powerful. This change is recovered, in part at leaſt, when it has taken place in a loadſtone or a magnet of hard ſteel; but in ſpring tempered ſteel the change is generally permanent, and almoſt to the full extent of its condition while the magnets are together. It is to be remarked, that this change is gradual; and is expedited by any of the other cauſes, particularly by heat or by knocking.

32
Magnetiſm may be acquired,

On the other hand, magnetiſm is acquired by the ſame means, when ſome other circumſtances are attended to.

1. By magnetical poſition,

1. A bar of iron, which has long ſtood in the magnetic direction, or nearly ſo, will gradually acquire magnetiſm, and the ends will acquire the polarity correſponding to their ſituation. In this country, and the north of Europe, the old ſpindles of turret vanes, old bars of windows, &c. acquire a ſenſible magnetiſm; their lower extremity becoming a north pole, and the other end a ſouth pole. Gilbert ſays, that this was firſt obſerved in Mantua, in the vane ſpindle of the Auguſtine church—"*Vento flexa* (ſays he) *de prompta, et apothecario cuidam conceſſa, attrahebat ferrea ramenta, vi perquam inſigni.*" The upper bar of a hand rail to a ſtair on the north ſide of the higheſt part of the ſteeple of St Giles's church in Edinburgh is very magnetical; and the upper end of it, where it is lodged in the ſtone, is a vigorous ſouth pole. It is worth notice, that the parts of ſuch old bars acquire the ſtrongeſt magnetiſm when their metallic ſtate is changed by expoſure to the air, becoming foliated and friable. It would be worth while to try, whether the æthiops martialis, produced by ſteam in the experiments for decompoſing water, will acquire magnetiſm during its production. The pipe and the wires, which are converted into the ſhining æthiops, ſhould be placed in the magnetic direction.

2. By hammering;

2. If a bar of ſteel be long hammered while lying in the magnetic direction, it acquires a ſenſible magnetiſm (See Dr Gilbert's plate, repreſenting a blackſmith hammering a bar of iron in the magnetic direction). The points of drills, eſpecially the great ones, which are urged by very great preſſure; and broaches, worked by a long lever, ſo as to cut the iron very faſt, acquire a ſtrong magnetiſm, and the lower end always becomes the north pole (*Phil. Tranſ.* xx. 417.). Even driving a hard ſteel punch into a piece of iron, gives it magnetiſm by a ſingle blow. In ſhort, any very violent ſqueeze given to a piece of tempered ſteel renders it magnetic, and its polarity correſponds with its poſition during the experiment. We can ſcarcely take up a cutting or boring tool in a ſmith's ſhop that is not magnetical. Even ſoft ſteel and iron acquire permanent magnetiſm in this way. Iron alſo acquires it by twiſting and breaking. It is therefore difficult to procure pieces of iron or ſteel totally void of determinate and permanent magnetiſm; and this frequently mars the experiments mentioned in the firſt paragraphs of this article. The way therefore to enſure ſucceſs in theſe experiments is to deprive the rods of their accidental magnetiſm, by ſome of the methods mentioned a little ago. Let them be heated red hot, and allowed to cool while lying in a direction perpendicular to the magnetic direction (nearly E. N. E. and W. S. W. in this country).

3. By heating;

3. As heat is obſerved to deſtroy magnetiſm, ſo it may alſo be employed to induce it on ſubſtances that are ſuſceptible of magnetiſm. Dr Gilbert makes this obſervation in many parts of his work. He ſays, that the ores of iron which are in that particular metallic ſtate which he conſiders as moſt ſuſceptible of magnetiſm, will acquire it by long continuance in a red heat, if laid in the magnetic direction, and that their polarity

is conformable to their poſition, that end of the maſs which is next the north becoming the north pole. He alſo made many experiments on iron and ſteel bars expoſed to ſtrong heats in the magnetical direction. Such experiments have been made ſince Gilbert's time in great number. Dr Hooke, in 1684, made experiments on rods of iron and ſteel one-fifth of an inch in diameter, and ſeven inches long. He found them to acquire permanent magnetiſm by expoſure to ſtrong heat in the magnetic direction, and if allowed to cool in that direction. But the magnetiſm thus acquired by ſteel rods was much ſtronger, and more permanent, if they were ſuddenly quenched with cold water, ſo as to temper them very hard. He found, that the end which was next to the north, or the lower end of a vertical bar, was always its permanent north pole. Even quenching the upper end, while the reſt was ſuffered to cool gradually, became a very ſenſible ſouth pole. No magnetiſm was acquired if this operation was performed on a rod lying at right angles to the magnetical direction.

In theſe trials the polarity was always eſtimated by the action on a mariner's needle, and the intenſity of the magnetiſm was eſtimated by the deviation cauſed in this needle from its natural poſition. Dr Gilbert made a very remarkable obſervation, which has ſince been repeated by Mr Cavallo, and publiſhed in the Philoſophical Tranſactions as a remarkable diſcovery. Dr Gilbert ſays, p. 69. "*Bacillum ferreum, valide ignitum appone verſorio excito; ſtat verſorium, nec ad tale ferrum convertitur: ſed ſtatim ut primum de candore aliquantulum remiſerit, confluit illico.*" In ſeveral other parts of his treatiſe he repeats the ſame thing with different circumſtances. It appears, therefore, that while iron is red hot, it is not ſuſceptible of magnetiſm, and that it is during the cooling in the magnetic direction that it acquires it. Gilbert endeavoured to mark the degree of heat moſt favourable for this purpoſe; but being unprovided with thermometers, he could not determine any thing with preciſion. He ſays, that the verſorium, or mariner's needle, was moſt deranged from its natural poſition a little while after the bar of iron ceaſed to ſhine in day-light, but was ſtill pretty bright in a dark room. But there are other experiments which we have made, and which will be mentioned by and bye; by which it appears, that although a bright red or a white heat makes iron unſuſceptible of magnetiſm while in that ſtate, it prediſpoſes it for becoming magnetical. When a bar of ſteel was made to acquire magnetiſm by tempering it in the magnetical direction, we found that the acquired magnetiſm was much ſtronger when the bar was made firſt of all very hot, even although allowed to come to its moſt magnetical ſtate before quenching, than if it had been heated only to that degree; nay, we always found it ſtronger when it was quenched when red hot. We offer no explanation at preſent; our ſole buſineſs juſt now being to ſtate facts, and to generalize them, in the hopes of finding ſome fact which ſhall contain all the others.

4. By juxtapoſition. 4. The moſt diſtinct acquiſitions and changes of magnetiſm are by juxtapoſition to other magnets and to iron. As the magnetiſm of a loadſtone or magnet is weakened by bringing its pole near the ſimilar pole of another magnet, it is improved by bringing it near the other pole; and it is always improved by bringing it near any piece of iron or ſoft ſteel.

But this action, and the mutual relation of magnets and common iron, being the moſt general, and the moſt curious and inſtructive of all the phenomena of magnetiſm, they merit a very particular conſideration.

Of the communication of Magnetiſm.

33 Communication of magnetiſm. The whole may be comprehended in one propoſition, which may be ſaid to contain a complete theory of magnetiſm.

Fundamental propoſition.

Any piece of iron, when in the neighbourhood of a magnet, is a magnet, and its polarity is ſo diſpoſed that the magnet and it mutually attract each other.

The phenomena which reſult from this fundamental principle are infinitely various, and we muſt content ourſelves with deſcribing a ſimple caſe or two, which will ſufficiently enable the reader to explain every other.

34 Attractive power communicated. Take a large and ſtrong magnet NAS (fig. 7.), of which N is the north, and S the ſouth pole. Let it be properly ſupported in a horizontal poſition, with its poles free, and at a diſtance from iron or other bodies. Take any ſmall piece of common iron, not exceeding two or three inches in length, ſuch as a ſmall key. Take alſo another piece of iron, ſuch as another ſmaller key, or a bit of wire about the thickneſs of an ordinary quill.

1. Hold the key horizontally, near one of the poles, (as ſhewn at n° 1.), taking care not to touch the pole with it; and then bring the other piece of iron to the other end of the key (it is indifferent which pole is thus approached with the key, and which end of the key is held near the pole). The wire will hang by the key, and will continue to hang by it, when we gradually withdraw the key horizontally from the magnet, till, at a certain diſtance, the wire will drop from the key, becauſe the magnetiſm imparted from this diſtance is too weak. That this is the ſole reaſon of its dropping, will appear by taking a ſhorter, or rather a ſlenderer, bit of wire, and touch the remote end of the key with it: it will be ſupported, even though we remove the key ſtill farther from the magnet.

2. Hold the key *below* one of the poles, as at n° 2. or 3. and touch its remote end with the wire. It will be ſuſpended in like manner, till we remove the key too far from the magnet.

3. Hold the key *above* the poles, as at n° 4. or 5. and touch its adjacent end with the wire (taking care that the wire do not alſo touch the magnet). The wire will ſtill be ſupported by the key, till both are removed too far from the magnet.

Thus it appears, that in all theſe ſituations the key has ſhewn the characteriſtic phenomenon of magnetiſm, namely, attraction for iron. In the experiment with the key held above the pole, the wire is in the ſame ſituation in reſpect to magnetiſm as the key is when held below the pole; but the actions are mutual. As the key attracts the wire, ſo the wire attracts the key.

If the magnet be ſupported in a vertical poſition, as in fig. 8. the phenomena will be the ſame; and when the key is held directly above or directly below the pole, it will carry rather a heavier wire than in the horizontal poſition of the magnet and key.

Inſtead of approaching the magnet with the key and wire, we may bring the magnet toward them, and the phenomena will be ſtill more palpable. Thus, if the bit of wire be lying on the table, and we touch one end of it with the key, they will ſhew no connection whatever. While we hold the key very near one end of the wire, bring down the pole of a magnet toward the key, and we ſhall then ſee the end of the wire riſe up and ſtick to the key, which will now ſupport it. In like manner, if we lay a quantity of iron filings on the table, and touch them with the key, in the abſence of the magnet, we find the key totally inactive. But, on bringing the magnet any how near the key, it immediately attracts the iron filings, and gathers up a heap of them.

35 Alſo a directive power.

In the next place, this vicinity of a magnet to a piece of iron gives it a directive power. Let NAS (fig. 9.) be a magnet, and BC (n° 1.) a key held near the north pole, and in the direction of the axis. Bring a very ſmall mariner's needle, ſupported on a ſharp point, near the end C of the key which is fartheſt from N. We ſhall ſee this needle immediately turn its ſouth pole towards C, and its north pole away from C. This poſition of the needle is indicated at *c*, by marking its north pole with a dart, and its ſouth with a croſs. Thus it appears that the key has got a directive power like a magnet, and that the end C is performing the office of a north pole, attracting the ſouth pole of the needle, and repelling its north pole. It may indeed be ſaid, that the needle at *c* arranges itſelf in this manner by the directive power of the magnet; for it would take the ſame poſition although the key were away. But if we place the needle at *b*, it will arrange itſelf as there repreſented, ſhewing that it is influenced by the key, and not (wholly at leaſt) by the magnet. In like manner, if we place the needle at *a*, we ſhall ſee it turn its north pole toward B, notwithſtanding the action of the magnet on it. This action evidently tends to turn its north pole quite another way; but it is influenced by B, and B is performing the office of a ſouth pole.

In like manner, if we place the key as at n° 2. we ſhall obſerve the end B attract the ſouth pole of the needle placed at *a*, and the end C attract the north pole of a needle placed in *b*. In this ſituation of the key, we ſee that B performs the office of a north pole, and C performs the office of a ſouth pole.

Thus it appears that the key in both ſituations has become a magnet, poſſeſſed of both an attractive and a directive power. It has acquired two poles.

36 The attraction of iron is owing to the diſpoſition of its own temporary magnetiſm.

Laſtly, the magnetiſm of the key is ſo diſpoſed, that the two magnets NAS and BC muſt mutually attract each other; for their diſſimilar poles front each other. Now, it is a matter of uniform and uncontradicted obſervation, that when a piece of iron is thus placed near a magnet, and the diſpoſition of its magnetiſm is thus examined by means of a mariner's needle, the diſpoſition is ſuch that two permanent magnets with their poles ſo diſpoſed muſt attract each other. The piece of iron, therefore, having the ſame magnetic relation to the magnet that a ſimilar and ſimilarly diſpoſed magnet has, muſt be affected in the ſame manner. We cannot, by any knowledge yet contained in this article, give any preciſe intimation in what way the polarity of the piece of iron will be diſpoſed. This depends on its ſhape as much as on its poſition. By deſcribing two or three examples, a notion is obviouſly enough ſuggeſted, which, although extremely gratuitous, and perhaps erroneous, is of ſervice, becauſe it has a general analogy with the obſerved appearances.

If one end of a ſlender rod or wire be held near the north pole of the magnet, while the rod is held in the direction of the axis (like the key in fig. 7. n° 1.), the near end becomes a ſouth, and the remote end a north pole. Keeping this ſouth pole in its place, and turning the rod in any direction from thence, as from a centre, the remote end is always a north pole. And, in general, the end of any oblong piece of iron which is neareſt to the pole of a magnet becomes a pole of the oppoſite name, while the remote end becomes a pole of the ſame name with that of the magnet.

If the iron rod be held perpendicularly to the axis, with its middle very near the north pole of the magnet, the two extremities of the iron become north poles, and the middle is a ſouth pole.

If the north pole of a magnet be held perpendicular to the centre of a round iron plate, and very near it, this plate will have a ſouth pole in its centre, and every part of its circumference will have the virtue of a north pole.

If the plate be ſhaped with points like a ſtar, each of theſe points will be a very diſtinct and vigorous north pole.

Something like this will be obſerved in a piece of iron of any irregular ſhape. The part immediately adjoining to the north pole of the magnet will have the virtue of a ſouth pole, and all the remote protuberances will be north poles.

The notion naturally ſuggeſted by theſe appearances is, that the virtue of a north pole ſeems to reſide in ſomething that is moveable, and that is protruded by the north pole of the magnet toward the remote parts of the iron; and is thus conſtipated in all the remote edges, points, and protuberances, much in the ſame manner as electricity is obſerved to be protruded to the remote parts and protuberances of a conducting body by the preſence of an overcharged body. This notion will greatly aſſiſt the imagination; and its conſequences very much reſemble what we obſerve.

As a farther mark of the complete communication of every magnetic power by mere vicinity to a magnet, we may here obſerve, that the wire D, of fig. 7. n° 2. and 3. will ſupport another wire, and this another; and ſo on, to a number depending on the ſtrength of the magnet. The key has therefore become a true magnet in every reſpect; for it induces complete magnetiſm on the appended wire. That this is not the ſame operation of the great magnet (at leaſt not wholly ſo), appears by examining the magnetiſm of D with the needle, which will be ſeen to be more influenced by D than by A. This fact has been long known. The ancients ſpeak of it: They obſerve, that a loadſtone cauſes an iron ring to carry another ring, and that a third; and ſo on, till the ſtring of rings appears like a chain.

37 Exception explained.

What has now been ſaid will explain a ſeeming exception to the univerſality of the propoſition. If the key be held in the ſituation and poſition repreſented by fig. 10. the bit of wire will not be attracted by it; and we may imagine that it has acquired no magnetiſm: But if we bring a mariner's needle, or a bit of wire, near to its remote end B, it will be ſtrongly attracted, and ſhew B to be a north pole. The needle held near to C will alſo ſhew C to be a ſouth pole. Alſo, if held near to D, it will ſhew D to be a north pole. Now the ends C, both of the key and of the wire, being ſouth poles, they cannot attract each other, but, on the contrary, they will repel; and therefore the wire will not adhere to the key. And if the key of fig. 17. n° 4. with the wire hanging to it, be gradually carried outward, beyond the north pole of the magnet, and then brought down till its lower end be level with the pole, the wire will drop off.

There is, however, one exception to the propoſition. If the key in fig. 7. with its appending wire D, be gradually carried from any of the ſituations 2, 3, 4, or 5, toward the middle of the magnet, the wire will drop off whenever it arrives very near the middle. If we ſuppoſe a plane to paſs through the magnetic centre A, perpendicular to the axis (which plane is very properly called the magnetic equitorial plane by Gilbert), a ſlender piece of iron, held anywhere in this plane, acquires no ſenſible magnetiſm. It gives no indication of any polarity, *and it is not attracted by the magnet.* It is well known, that the activity of a loadſtone or magnet reſides chiefly in two parts of it, which have been called its poles; and that thoſe are the beſt magnets or loadſtones in which this activity is leaſt diffuſed; and that a certain circumference of every loadſtone or magnet is wholly inactive. When a loadſtone or magnet of any ſhape is laid among iron filings, it collects them on two parts only of its ſurface, and between theſe there is a ſpace all round, to which no filings attach themſelves.

We preſume that the reader already explains this appearance to himſelf. Many things ſhew a contrariety of action of the two poles of a magnet. We have already obſerved, that the north pole of a ſtrong magnet will produce a ſtrong northern polarity in the remote end of a ſmall ſteel bar; and, if it be then applied near to that end in the oppoſite direction, it will deſtroy this polarity, and produce a ſouthern polarity. In whatever theſe actions may conſiſt, there is ſomething not only different but oppoſite. They do not blend their effects, as the yellow and blue making rays do in producing green. They oppoſe each other, like mechanical preſſures or impulſions. We have every mark of mechanical action; we have local motion, though unſeen, except in the gradual progreſſion of the magnetical faculties along the bar; but we have it diſtinctly in the ultimate effect, the approach or receſs of the magnets: and in theſe phenomena we ſee plainly, that the forces, in producing their effects, act in oppoſite directions. Whatever the internal inviſible motions may be, they are compoſed of motions whoſe equivalents are the ſame with the equivalents of the ultimate, external, ſenſible motions; therefore the internal motions are oppoſite and equal if the ſenſible motions are ſo, and converſely.

Adopting this principle, therefore, that the actions of the two poles are not only different but oppoſite, it follows, that if they are alſo equal and act ſimilarly, each muſt *prevent* the action of the other; and that there will be a mechanical equilibrium—it may even be called a magnetical equilibrium. Therefore if every part of a ſlender rod, or of a thin plate of iron, lie in the plane of the magnetic equator, the magnetic ſtate (in whatever it may conſiſt) cannot be produced in it. It will exhibit no magnetiſm; have no polar faculties; and we can ſee no reaſon why it ſhould be attracted by the magnet, or ſhould attract iron. We muſt not forget to obſerve in this place, that iron in a ſtate of incandeſcence acquires no magnetiſm by juxtapoſition. We have already remarked, that iron in this ſtate does not affect the magnet. If a bar of red hot iron be ſet near a mariner's needle, it does not affect it in the ſmalleſt degree till it almoſt ceaſes to appear red hot in day-light, as has been obſerved by Dr Gilbert. All actions that we know are accompanied by equal and oppoſite re-actions; and we ſhould expect, what really happens in the preſent caſe, namely, that red hot iron ſhould not be rendered magnetical and attractable.

38
Magnetiſm not impaired by communication.

There is a very remarkable circumſtance which accompanies the whole of this communication of magnetiſm to a piece of iron. It does not impair the power of the magnet; but, on the contrary, improves it. This fact was obſerved, and particularly attended to, by Dr Gilbert. He remarks, that a magnet, in the hands of a judicious philoſopher, may be made to impart more magnetiſm than it poſſeſſes to each of ten thouſand bars of ſteel, and that it will be more vigorous than when the operations began. A magnet (ſays he) may be ſpoiled by injudicious treatment with other magnets, but never can touch a piece of common iron without being improved by it. He gives a more direct proof. Let a magnet carry as heavy a lump of iron as poſſible by its lower pole. Bring a great lump of iron cloſe to its upper pole, and it will now carry more. Let it be loaded with as much as it can carry while the lump of iron touches its upper pole. Remove this lump, and the load will inſtantly drop off. But the following experiment ſhews this truth in the moſt convincing manner:

Let NAS (fig. 11.) be a magnet, not very large, nor of extreme hardneſs. Let CD be a ſtrong iron wire, hanging perpendicularly from a hook by a ſhort thread or loop. The magnet, by its action on CD, renders D a north pole and C a ſouth pole, and the polarity of D's magnetiſm fits it for being attracted. Let it aſſume the poſition C *e*, and let this be very carefully marked. Now bring a great bar of iron *s* B *n* near to the other end of the magnet. We ſhall inſtantly perceive the wire C *e* approach to the ſouth pole of the magnet, taking a poſition C *f*. Withdraw the bar of iron, and C *f* will fall back into the poſition C *e*. As we bring the iron bar gradually nearer to the magnet, the wire will deviate farther from the perpendicular, and when the bar B touches the magnet CD, will ſtart a great way forward. It is alſo farther to be obſerved, that the larger the bar of iron is, the more will CD deviate from the perpendicular.

Now this muſt be aſcribed to the action of the bar on the magnet. For if the magnet be removed, the bar alone will make no ſenſible change on the poſition of the wire. We know that the bar of iron becomes magnetical by the vicinity of the magnet. If we doubt this, we need only examine it by means of a piece of iron or a mariner's needle. This will ſhew us that *s* has become a ſouth, and *n* a north pole. Here then are two magnets with their diſſimilar poles fronting each other. In conformity with the whole train of magnetical phenomena, we muſt conclude that they attract each other, and muſt improve each other's magnetiſm.

This is a moſt important circumſtance in the theory of

39
Therefore nothing is transferred.

of magnetiſm. For it ſhews us, that, in rendering a piece of iron magnetic, there is no material communication. There is no indication of the transference of any ſubſtance reſiding in the magnet into the piece of iron; nor is there even any transference of a power or quality. Were this the caſe, or if the ſubſtance or quality which was in A be now transferred to B, it can no longer be in A; and therefore the phenomena reſulting from its preſence and agency muſt be diminiſhed. We muſt ſay that the magnet has excited powers inherent, but dormant, in the iron; or is, at leaſt, the occaſion of this excitement, by diſturbing, in ſome adequate manner, the primitive condition of the iron. We muſt alſo ſay, that the competency of the magnet and of the iron to produce the phenomena, is owing to the ſame circumſtances in both; becauſe we ſee nothing in the phenomena which authoriſes us to make any diſtinction between them. Whatever therefore cauſes one magnet to attract another, is alſo the reaſon why a piece of iron in the neighbourhood of a magnet attracts another piece of iron; and we muſt ſay that the cauſe of polarity, or the origin of the directive power, is the ſame in both. Now we underſtand perfectly the directive power of a magnet, as exerted on another magnet. We ſee that it ariſes from a combination and mechanical compoſition of attractions and repulſions. It muſt be the ſame in this magnetiſm now inherent in the iron. The piece of iron directs a mariner's needle, as a magnet would direct it; therefore, as there is ſomething in a piece of iron which *now* attracts ſomething in another piece of iron, ſo there is ſomething in the firſt which repels ſomething in the laſt.

40
Objections anſwered by a curious fact.

It may indeed be ſaid that it is not a piece of iron, but a mariner's needle, or magnet, that is thus directed by our iron magnetiſed by vicinity to a magnet. This objection is completely removed by the moſt curious of all the facts which occur in this manner of producing magnetiſm. Take a piece of common iron, faſhion it, and fit it up preciſely like a mariner's needle, and carefully avoid every treatment that can make it magnetical. Set it on its pivot, and bring it near the north pole of a magnet, placing the end, made like the ſouth pole of the needle, next to the north pole of the magnet. In ſhort, place it by hand exactly as a real mariner's needle would arrange itſelf. It will retain that poſition. Now carry it round the magnet, along the circumference of a magnetic curve, or in any regular and continuous route. This piece of iron will, in every ſituation, aſſume the very ſame poſition or attitude which the real magnetical needle would aſſume if in the ſame place, and it will oſcillate preciſely in the ſame way.

Here then it is plain, that there is no diſtinction of power between the magnetiſm of the iron and of the real needle. To complete the proof: Inſtead of approaching the magnet with this iron needle, bring it into the vicinity of a piece of iron, which is itſelf magnetical only by vicinity to a magnet, it will arrange itſelf juſt as the real needle would do, with the ſole difference, that it does not indicate the *kind* of polarity exiſting in the extremities of the iron, becauſe either end of it will be attracted by them. And this circumſtance leads us to the conſideration of the only diſtinction between the magnetiſm of a loadſtone or magnet and that of common iron.

41
Magnetiſm of iron is tranſitory and indifferent; but that of magnets is durable and determinate.

The magnetiſm of common iron is momentary, and therefore indifferent; whereas that of a magnet is permanent and determinate. When iron becomes magnetic in the way now mentioned, it remains ſo only while the magnet remains in its place; and when that is removed, the iron exhibits no ſigns of magnetiſm. Therefore when the north pole of a magnet has produced a ſouth pole in the neareſt end of an iron wire, and a north pole at its remote end, if we turn the magnet, and preſent its ſouth pole, the neareſt end of the wire inſtantly becomes a north pole, and the other a ſouth pole; and this change may be made as often, and as rapidly, as we pleaſe. This is the reaſon which made us direct the experimenter on the iron needle to begin his operation, by placing the end marked for a ſouth pole next to the north pole of the magnet. It becomes a real ſouth pole in an inſtant, and acts as ſuch during its peregrination round the magnet. But in any one of its ſituations, if we turn it half round with the finger, the end which formerly turned away from a pole of the magnet, will now turn as vigorouſly toward it. Therefore, in carrying the iron needle round the magnet, we directed the progreſs to be made in a continuous line, to avoid all chance of miſtaking the polarities.

42
MAGNETISM OF INDUCTION.

For all the reaſons now adduced, we think ourſelves obliged to ſay, that the magnetiſm produced on common iron by mere juxtapoſition to a magnet, is generated without any *communication* of ſubſtance or faculty. The power of producing magnetical phenomena is not *ſhared* between the magnet and the iron. We ſhall call it INDUCED MAGNETISM; MAGNETISM BY INDUCTION.

We have ſaid that induced magnetiſm of common iron is quite momentary. This muſt be underſtood with careful limitations. It is ſtrictly true only in the caſe of the fineſt and pureſt ſoft iron, free of all knots and hard veins, and therefore in its moſt metallic ſtate. Iron is rarely found in a ſtate ſo very pure and metallic; and even this iron will acquire permanent and determinate magnetiſm by induction, if it has been twiſted or hammered violently, although not in the magnetic direction; alſo the changes produced (we imagine) on the pureſt iron by the action of the atmoſphere make it ſuſceptible of fixed magnetiſm. But the magnetiſm thus inducible on good iron is ſcarcely ſenſible, and of no duration, unleſs it has lain in the neighbourhood of a magnet for a very long while.

What has now been ſaid of common iron, is alſo true of it when in the ſtate of ſoft ſteel.

43
Tempered ſteel acquires durable magnetiſm.

But any degree of temper that is given to ſteel makes a very important change in this reſpect. In the firſt place, it acquires magnetiſm more ſlowly by induction than an equal and ſimilar piece of common iron, and finally acquires leſs. Theſe differences are eaſily examined by the deviations which it cauſes in the mariner's needle from the magnetic meridian, and by its attraction.

When the inducing magnet is removed, ſome magnetiſm remains in the ſteel bar, which retains the polarity which it had in the neighbourhood of the magnet.

Steel tempered to the degree fit for watch ſprings acquires a ſtrong magnetiſm, which it exhibits immediately on the removal of the magnet. But it diſſipates very faſt; and, in a very few minutes, it is reduced to leſs than one-half of its intenſity while in contact with the magnet, and not two-thirds of what it was immediately on removal from it. It continues to diſſipate for ſome days, though the bar be kept with care; but the diſſipation diminiſhes faſt, and it retains at leaſt one-third of its greateſt power for any length of time, unleſs careleſsly kept or injudiciouſly treated.

Steel tempered for ſtrong cutting tools, ſuch as chiſels, punches, and drills for metal, acquires magnetiſm ſtill more ſlowly by induction, and acquires leſs of it while in contact with the magnet; but it retains it more firmly, and finally retains a greater proportion of what it had acquired.

Steel made as hard as poſſible, is much longer in acquiring all the magnetiſm which ſimple juxtapoſition can give to it. It acquires leſs than the former; but it retains it with great firmneſs, and finally retains a much greater proportion.

Such ores of iron as are ſuſceptible of magnetiſm, are nearly like hard ſteel in theſe reſpects; that is, in the time neceſſary for their *greateſt* impregnation, and in the durability of the acquired magnetiſm. They differ exceedingly in reſpect to the degree of power which they can attain by mere juxtapoſition, and the varieties ſeem to depend on heterogeneous mixture. We muſt obſerve, that few ores of iron are ſuſceptible of magnetiſm in their natural ſtate. The ordinary ores, conſiſting of the metal in the ſtate of an oxyd, and combined with ſulphur, are not magnetizable while remaining in that ſtate. Moſt ores require roaſting, and a ſort of cementation, in contact with inflammable ſubſtances. This matter is not well underſtood; but it would ſeem that complete metallization is far from being the moſt favourable condition, and that a certain degree of oxydation, and perhaps ſome other compoſition, yet unknown, make the beſt loadſtones. But all this is extremely obſcure. The late Dr Gowin Knight made a compoſition which acquired a very ſtrong and permanent magnetiſm, but the ſecret died with him. Dr Gilbert ſpeaks of ſimilar compoſitions, in which ferrugineous clays were ingredients; but we know nothing of the ſtate of the metal in them, nor their mode of acquiring magnetiſm.

44
Induction of magnetiſm is gradual and progreſſive.

It is of peculiar importance to remark that the acquiſition of magnetiſm is gradual and progreſſive, and that the gradation is the more perceptible in proportion as the ſteel is of a harder temper. When a magnet is brought to one end of a bar of common iron, its remote extremity, unleſs exceedingly long, acquires its utmoſt magnetiſm immediately. But when the north pole of a magnet is applied to one end of a bar of hard ſteel, the part in contact immediately becomes a ſouth pole, and the far end is not yet affected. We obſerve a north pole formed at ſome diſtance from the contact, and beyond this a faint ſouth pole. Theſe gradually advance along the bar. The remote extremity becomes firſt a faint ſouth pole, and it is not till after a very long while (if ever) that it becomes a ſimple, vigorous, north pole. More frequently it remains a diffuſed and feeble north pole: nay, if the bar be very long, it often happens that we have a ſucceſſion of north and ſouth poles, which never make their way to the far end of the bar. This phenomenon was firſt obſerved (we think) by Dr Brook Taylor, who gives an account of his obſervations in the *Philoſophical Tranſactions*, nº 344.

45
Iron is attracted only becauſe it becomes magnetical.

From the account we have given of theſe phenomena of induced magnetiſm, it appears that the temporary magnetiſm is always ſo diſpoſed that the ſum of the mutual attractions of the diſſimilar poles exceeds the ſum of the repulſions between the ſimilar poles, and that therefore the two magnets tend to each other. This is evidently equivalent to ſaying, that a piece of unmagnetic iron is always attracted by a magnet. No exception has ever been obſerved to this fact; for Pliny's ſtory of a Theamedes, or loadſtone, which repels iron, is allowed by all to have been a fable.

We think ourſelves authoriſed to ſay that this attraction of the loadſtone for iron, or this tendency of iron to the loadſtone, is a ſecondary phenomenon, and is the *conſequence* of the proper diſpoſition of the induced magnetiſm. The proofs already given of the compound nature of this phenomenon, namely, that it ariſes from the exceſs of two attractions above two repulſions, need (we imagine) no addition. But the following conſiderations place the matter beyond doubt:

1. The magnetiſm of the two poles is evidently of an oppoſite nature; the one repelling what the other attracts. If the one attracts iron, therefore, the other ſhould repel it. But each pole, by inducing a magnetiſm oppoſite to its own, on the neareſt end of the iron, and the ſame with its own on the remote end, and its action diminiſhing with an increaſe of diſtance, there muſt always be an exceſs of attraction, and the iron muſt be attracted.

2. Each of the magnets A and B, in either of the poſitions repreſented in fig. 12. would alone attract the piece of common iron C. But when placed together, the ſouth pole of A tends to render the upper end of C a north pole; while the north pole of B tends to make it a ſouth pole. If their actions be nearly equal, the weight of C cannot be ſupported by the magnetiſm induced by any difference of action that may remain. While C is hanging by B alone, let A be gradually bronght near; it gradually deſtroys the action of the north pole of B, ſo that C gradually loſes it magnetiſm and polarity, and its weight prevails.

3. In all thoſe caſes where the induction of magnetiſm is ſlow, the attraction is weak in proportion. This is particularly remarked by Dr Gilbert. If we take pieces of common iron, and of ſteel of different tempers, but all of the ſame ſize and form, we ſhall find that the iron is much more ſtrongly attracted than any of the reſt, and that the attraction for each of them is weaker in proportion as they are harder. This diverſity is ſo accurately obſerved, that when the piece is thoroughly ſuſceptible of magnetiſm, we can tell, with conſiderable preciſion, what degree will be ultimately acquired, and how much will be finally retained. Alſo, the attraction of the magnet for any of thoſe pieces of ſteel increaſes exactly in proportion as their acquired magnetiſm increaſes.

4. An ore of iron incapable of acquiring magnetiſm is not attracted by a magnet. But we know that, by cementation with charcoal duſt, they may be rendered ſuſceptible of magnetiſm. In this ſtate they are attracted. It is an univerſal fact, that any ſubſtance that is attracted by a magnet may be rendered magnetical, and that none elſe can. We have already obſerved that red hot iron is not attracted; nor does it acquire any directive power while in that ſtate. From all this we muſt conclude, that the previous induction of magnetiſm is the mean of the obſerved attraction of magnets for iron, and that this is not a primary fact in magnetiſm.

Theſe obſervations alſo complete the proof that magnetic attraction and repulſion are equal at the ſame diſtance, and follow the ſame law. Dr Gilbert ſeems to think that the repulſion is always weaker than the attraction; and this is almoſt the only miſtake in conception into which that excellent philoſopher has fallen. But it only requires a fair compariſon of facts to convince a good logician, that ſince, *in every caſe*, and at every diſtance, either pole of a magnet attracts either end of a piece of common iron, it is impoſſible that one of theſe forces can exceed the other. It might be ſo, were it not that induced magnetiſm is durable in proper ſubſtances. And if we take magnets which have been made ſuch by induction, and preſent them to each other with their ſimilar poles fronting each other, they never fail to repel each other at conſiderable diſtances, and even at very ſmall diſtances for a few moments; and this is the caſe whichever poles are next each other. This cannot be on any other ſuppoſition. Caſes would occur of polarity without attraction, or of attraction without polarity. Such have never been ſeen, any more than the Theamedes, always repelling iron.

46
Phenomena of iron ſhreds and filings.

Let a great number of ſmall oblong pieces of iron be lying very near each other on the ſurface of quickſilver. Bring a ſtrong magnet into the midſt of them. It immediately renders them all magnetical by induction. The one neareſt the north pole of the magnet immediately turns one end toward it, and the other end away from it. The ſame effect is produced on the one that is juſt beyond this neareſt one. Thus the remote end of the firſt becomes a north pole, and the neareſt end of the ſecond becomes a ſouth pole. Theſe, being very near each other, muſt mutually attract. The ſame thing may be ſaid of a third, a fourth; and ſo on. And thus it appears, that not only is magnetiſm induced on them all, but alſo, that the magnetiſm of each is ſo diſpoſed, that both ends of it are in a ſtate of attraction for the ends of ſome of its neighbours; and that they will therefore arrange themſelves by coaleſcence in ſome particular manner. Should a parcel of them chance to be ſtanding with their centres in a magnetic curve, with their heads and points turned in any ways whatever, the moment that the magnet is brought among them, and ſet in the axis of that magnetic curve, the whole pieces of this row will inſtantly turn towards each other, and their ends will adhere together, if they are near enough; otherwiſe they will only point toward each other, forming a ſet of tangents to the magnetic curve, reaching from one pole of the magnet to the other.

Or, ſuppoſe a vaſt number of ſmall bits of iron, each ſhaped like a grain of barley, a little oblong. Let them be ſcattered over the ſurface of a table, ſo near each other as juſt to have room to turn round. Let a magnet be placed in the midſt of them. They will all have magnetiſm induced on them in an inſtant; and ſuch as are not already touching others, will turn round (becauſe they reſt on the table by one point only), and each will turn its ends to the ends of its neighbours; and thus they will arrange themſelves in curves, which will not differ greatly from true magnetic curves (becauſe each grain is very ſhort), iſſuing from one pole of the magnet, and terminating in the other.

Does not this ſuggeſt to the reflecting reader an explanation of that curious arrangement of iron filings round a magnet, which has ſo long entertained and puzzled both the philoſophers and the unlearned, and which has given riſe to the Carteſian and other theories of magnetiſm? The particles of iron filings are little rags of ſoft iron torn off by the file, and generally a little oblong. Theſe *muſt* have magnetiſm induced on them by a magnet, and, while falling through the air from the hand that ſtrews them about the magnet, they are at perfect liberty to arrange themſelves magnetically; and *muſt therefore ſo arrange themſelves*, forming on the table curves, which differ very little indeed from the true magnetic curves. Suppoſe them ſcattered about the table before the magnet is laid on it. If we pat the table a little, ſo as to throw it into tremors, this will allow the particles to dance, and turn round on their points of ſupport, till they coaleſce by their ends in the manner already deſcribed.

All this is the genuine and inevitable conſequence of what Dr Gilbert has taught us of induced magnetiſm. It muſt be ſo; and cannot be otherwiſe. This curious arrangement of iron filings round a magnet is therefore not a primary fact, and a foundation for a theory, but the reſult of principles much more general.

47
Remarks on the theories by impulſion.

Moſt of our readers know that this diſpoſition of iron filings has given riſe to the chief mechanical theories which have been propoſed by ingenious men for the explanation of all the phenomena of magnetiſm. An inviſible fluid has been ſuppoſed to circulate through the pores of a magnet, running along its axis, iſſuing from one pole, ſtreaming round the magnet, and entering again by the other pole. This is thought to be indicated by thoſe lines formed by the filings. The ſtream, running alſo through *them*, or around them, arranges them in the direction of its motion, juſt as we obſerve a ſtream of water arrange the flote graſs and weeds. It would require a volume to detail the different manners in which thoſe mechanicians attempt to account for the attraction, repulſion, and polarity of magnetic bodies, by the mechanical impulſion of this fluid. Let it ſuffice to ſay, that almoſt every ſtep of their theories is in contradiction to the acknowledged laws of impulſion. Nay, the whole attempt is againſt the firſt rule of all philoſophical diſcuſſion, never to admit for an explanation of phenomena the agency of any cauſe which we do not know to exiſt, and to operate in the very phenomenon. We know of no ſuch fluid; and we can demonſtrate, that the genuine effects of its impulſion would be totally unlike the phenomena of magnetiſm. But the proper refutation of theſe theories would fill volumes. Let it ſuffice (and to every logician it will abundantly ſuffice) to remark, that this phenomenon is but a ſecondary fact, depending on, and reſulting from, principles much more general, viz. the induction of magnetiſm, and the attraction of diſſimilar, and repulſion of ſimilar, poles.

The above explanation of the curious diſpoſition of iron filings round a magnet, occurred to the writer of this article while ſtudying natural philoſophy, on ſeeing the Profeſſor exhibit Mr Henſhaw's beautiful experiment in proof of terreſtrial magnetiſm*. He at that time imagined himſelf the author, and promiſed himſelf ſome credit for the thought. But having ſeen the *Phyſiologia Nova de Magnete* by Dr Gilbert, he found that it had not eſcaped the notice of that ſagacious philoſopher; as will appear paſt diſpute from the following paſſage, as well as ſome others, leſs pointed, in that work. "Magnetica fruſta (that is, ſubſtances ſuſceptible of magnetiſm) bene et convenienter intra vires poſita, mutuo cohærent. Ferramenta, preſente magnete (etiamſi magnetem non attingant), concurrunt, ſolicité ſe mutuo quærunt, et amplexantur, et, conjuncta, quaſi ferruminantur." Scobs ferrea, vel in pulverem redacta, fiſtulis impoſita chartaceis—ſupara lapidem meridionaliter locata, vel propius tantum admota, in unum coaleſcet corpus; et ſubito tam multæ partes concreſcunt et combinantur; ferrumque aliud affectat conjuratorum turma et attrahit, ac ſi unum tantum et integrum eſſet ferri bacillum; dirigiturque ſupra lapidem in ſeptemtriones et meridiem Sed cum longius a magnete removeantur (tanquam ſoluta rurſus) ſeparantur, et diffluunt ſingula corpuſcula." B. ii. c. 23.

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* See VARIATION, *Encycl.* p. 621.

Mr Æpinus alſo had taken the ſame view of the ſubject*. It is alſo very clearly conceived and expreſſed by the celebrated David Gregory, Savilian Profeſſor of aſtronomy in the Univerſity of Oxford, in a MS. volume of notes and commentaries, written by him in 1693, on Newton's *Principia*, and uſed by Newton in improving the ſecond edition. The M. S. is now in the library of the univerſity of Edinburgh. Gregory's words are as follow: "Mihi ſemper dubium viſum eſt num magnetica virtus mechanicé, *i. e.* per impulſum, producatur. Mirum eſt, effluvia, quæ ferrum agitare valent, bracteas aureas *interpoſitas* ne vel minimum a loco movere. Lucretii et Carteſii theoriam, de fugato intermedio aëre, refutat experimentum infra aquam inſtitutum. *Sulci in limatura ferri, magneti in plano cujuſvis meridiani circumpoſita, non fiunt ab effluviis ſecundum iſtos canales motis, ſed ex inde, quod ipſa ramenta, magnetice excitata, ſeſe ſecundum longitudinem et ſecundum polos diſponunt.* Ex altera vero parte exinde quod vis magnetica, interveniente flamma aut calore, interrumpatur, quod virga ferrea, vel diuturno ſitu perpendiculari, vel in eo ſitu frigeſcendo, virtutem magneticam a tellure acquirat, ut nos docet perſpicaciſſimus Gilbertus. Quod mallei ſuper incudem ictu forti ad alterum extremum, virtutem acquirat magneticam; quod ictu forti vel ſaltem fortiori ad alterum extremum poli permutantur, ut qui prius ſeptemtriones reſpiciebat nunc auſtrum reſpicit; quod ictu forti ad medium, virtutem illam prorſus amittat. Hæc inquam, et ſimilia, mechanicam ejus qualitates ortum arguunt. Hugenius præter gravitatem, etiam magneticam, et electricam virtutem, aliaſque plures experimento novit vires naturales, ut mihi ipſi narravit hac eſtate anni 1693. Qualis ut hæc forſitan quod cymba papyracea, prope labra vaſis aquam, cui innatet, continentis, poſita, labrum viciniſſimum continuo, et cum impetu petat (A)." *Nat. MS. in Prop.* 23. ii. *Prin.*

*See § 306.

48 Filings are weakly attracted.

Not only the mere arrangement of the filings in curve lines follows of neceſſity from the properties of induced magnetiſm, but all the ſubordinate circumſtances of this phenomenon are included in the ſame explanation. By continuing to tap the table, and throw it into tremors, the filings are obſerved to approach gradually, but very ſlowly, to the poles of the magnet. Each particle is a very ſmall temporary magnet. The attractive power of the great magnet, $\overline{m-p}-\overline{n-q}$, is therefore extremely ſmall in proportion to its directive power, $\overline{m+p}-\overline{n+q}$. And we obſerve that the accumulation of the filings round the poles of the magnet is ſo much the ſlower as the filings are finer.

49 Curious fact.

If a paper be laid above the magnet, and the filings be ſprinkled on it, we obſerve them to conſtipate along its edges, while none remain immediately above its ſubſtance; they are all beyond, or on the outſide of its outline, and they are obſerved not to be lying flat on the paper, but to be ſtanding obliquely on one point. They move off from the paper immediately above the magnet, becauſe they repel each other. They ſtand obliquely from the edges becauſe that is the direction of a magnetic meridian at its parting from the pole. If the magnet be at ſome diſtance below the paper, then tapping the paper will cauſe the filings to move away from the magnet laterally. This ſingular and unexpected appearance is owing to the combination of gravity with the magnetic action. A particle, ſuch as *n s* (fig. 13.), reſts on the paper by the point *n*, which is a temporary north pole (S being ſuppoſed the ſouth pole of the magnet). The particle takes a poſition *n s* nearer to the horizon than the poſition *n o*, which it would take if its centre of gravity *b* were ſupported. The poſition is ſuch, that its weight, acting vertically at *b*, is in equilibrio with the magnetic repulſion *s d*, exerted between S and *s*. When the paper is tapped, it is beaten down, or withdrawn from *n*, and the particle of iron is left for a moment in the air. It therefore turns quickly round *b*, in order to aſſume a poſition parallel to *n o*, and it meets the paper, as that riſes again after the ſtroke, in a point farther removed from the magnet, and again deſcends by its weight (turning round the newly ſupported point *n*), till it again takes a poſition parallel to *n s*, but farther off, as repreſented by the dotted line. Thus it travels gradually outwards from the magnet appearing to be repelled, although it is really attracted by it. If the magnet be held above the paper, at a little diſtance, the filings, when we repeatedly pat the paper, gradually collect into a heap under it. This will appear very plainly to one who conſiders the ſituation of a particle in the manner now explained.

50 Filings arrange in magnetic curves.

The curve lines formed by very fine filings approach very nearly to the form of the primary curve which indicates the law of magnetic action in the way already explained. If the magnet be placed under water, and if filings be ſprinkled copiouſly on the ſurface of it from a gauze ſearce, held at ſome diſtance above it, the reſiſtance to their motion through the water gives them time to arrange themſelves magnetically before they reach the bottom, and the lines become more accurate. But they were ſo much deranged by any method that we could take for removing the water, and meaſuring them, that we were diſappointed in our expectations of obtaining a very near approximation to the law of action.

51 Alſo in ſecondary curves.

We took notice of ſome very ſingular phenomena of a compaſs needle in the neighbourhood of two magnets, and we obſerved that, in this caſe alſo, the needle was always a tangent to a curve of another kind, and which we called *ſecondary* and *compound magnetic curves*. Theſe are

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(A) Perhaps it may be proper to obſerve, that Dr Gregory expreſſes his differing in his opinion from Newton about magnetiſm. Newton, in this propoſition, thinks, that the law of magnetic action approaches to the inverſe triplicate ratio of the diſtances. Dr Gregory invalidates the argument uſed by Newton.

are produced in the ſame way, by ſtrewing iron filings round the magnets. Many repreſentations have been given of theſe curves by different authors, particularly by Muſchenbrock, in his *Eſſais de Phyſique;* and by Fuſs in the *Comment Petropolit.* Great uſe has been made of theſe arrangements of filings by two magnets in the theories of magnetiſm propoſed by thoſe who inſiſt on explaining all motion by impulſe. When the diſſimilar poles of two magnets A and B (fig. 14.) face each other, the curves formed by the filings conſiderably reſemble thoſe which ſurround a ſingle magnet, and give the whole ſomewhat of the appearance of a magnet with very diffuſed poles. The arranging fluid, which ſtreams from one pole of a magnet, is ſuppoſed to meet with no obſtruction to its entry into the adjoining pole of the other magnet, but, on the contrary, to be impelled into it; and therefore (ſay the propoſers) it circulates round both as one magnet, and by its vortex brings the magnets together; which phenomenon we call the attraction of the magnets. But when the ſimilar poles front each other; for example, the poles from which the arranging fluid iſſues, then the two ſtreams meet, obſtruct each other, accumulate, and, by this accumulation, cauſe the magnets to recede from each other; which we call the repulſion of the magnets. This is the only explanation of this kind that can make any pretenſions to probability, or indeed that can be conceived. For how the free circulation in the former caſe can bring the two magnets together, no perſon can form to himſelf any conception. We ſee nothing like this produced by any vortex that we are acquainted with. All ſuch vortices cauſe bodies to ſeparate. But even this explanation of magnetic repulſion is inadmiſſible. It will not apply to the repulſion of the receiving poles; and the phenomena of the filings are inconſiſtent with the notion of accumulation. The filings indeed accumulate, and they look not unlike two ſtreams which oppoſe each other, and deflect to the ſides (See fig. 15.): But, unfortunately, by tapping the paper gently, the filings do not move off from the magnets, but approach them much faſter than in any other experiment. The phenomenon receives a complete and palpable explanation from the principles we have eſtabliſhed. Both magnets concur in giving the ſame polarity to every particle of the filings. Thus, if the fronting poles are north poles, each particle has its neareſt end made a vigorous ſouth pole, and its remote end a north pole; and it is *therefore* ſtrongly attracted towards both magnets while it is arranged in the tangent to the ſecondary curve of that claſs, which croſſes the others nearly at right angles.

52 Magnets muſt affect each other. Since it is found, that the magnetiſm, even of natural loadſtones and hard ſteel, and ſtill more thoſe of ſofter tempered ſteel, are continually tending to decay; and ſince we find that it may be induced by mere approach to a magnet; and ſince we know that magnets may oppoſe, each other in producing it—it is reaſonable to ſuppoſe, that when a piece of iron has acquired a ſlight, though permanent magnetiſm, by the vicinity of a magnet, a magnet applied in the oppoſite direction will deſtroy it, and afterwards produce the oppoſite magnetiſm.

Accordingly, we may change the poles of ſoft magnets at pleaſure.

Farther; ſince we find that loadſtones and hard tempered ſteel bars are diſtinguiſhed from ſoft ones only by the *degree* of obſtinacy with which they retain their preſent condition, we ſhould alſo expect that hard magnets will even affect each other. It muſt therefore happen, that a powerful magnet applied to a weak one, ſo that their ſimilar poles are in contact, ſhall weaken, deſtroy, and even change the the magnetiſm of the weaker. Dr Knight's famous magazine of magnets enabled him to change the poles of the greateſt and the ſtrongeſt natural loadſtone, or artificial magnet, that could be given him, in the ſpace of one minute.

53 Attraction muſt appear to exceed repulſion. We now ſee clearly the reaſon why magnetic repulſion is weaker than attraction at the ſame diſtance. When magnets are placed with their ſimilar poles fronting each other, in order to make trials of their repulſion, they really do weaken each other and are not in the ſame magnetical condition as before. For ſimilar reaſons, we ſee how experiments with magnets attracting each other rather improve them, and make their attractive powers appear greater than they are. All theſe effects muſt be moſt remarkable in ſoft magnets, eſpecially when long.

54 The obſerved law differs from the true. We alſo ſee, that the obſerved law of attraction and repulſion between two magnets muſt be different from the real law of magnetic action. For, in the experiments made on attraction at different diſtances, beginning with the greateſt diſtance, the magnetiſm is continually increaſing, and the attraction will appear to increaſe in a higher rate than the juſt one; the contrary may happen, if we begin with the ſmaller diſtances. The reſults of experiments on repulſion muſt be ſtill more erroneous; becauſe it is eaſier to diminiſh any accumulation which required an exertion to produce it, than to puſh it ſtill farther.

55 Magnetiſm improves by inducing it on iron. We have now a complete explanation of the remarkable fact, that the induction of magnetiſm does not weaken the magnet employed; but, on the contrary, improves it. The magnetiſm induced on the iron cauſes it to act on the magnet employed in the very ſame manner that a permanent magnet of the ſame ſhape, ſize, and ſtrength, would do. Nay, it will have even a greater effect; for as it improves the magnet, its own induced magnetiſm will improve; and will therefore ſtill farther improve the magnet.

56. Hence it is, that, in whatever manner a magnet touches a piece of iron, it improves by it. It may be hurt by a magnet in an improper poſition; but it always puts common iron into a ſtate which increaſes its own magnetiſm. This has been known as long as magnetiſm itſelf; and the ancients conceived the notion, that the magnet ſomehow fed upon the iron (B).

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(B) So Claudian.——" Nam ferro nurunt vitam, ferrique vigore
Veſcitur, hoc dulces epulas, hoc pabula novit
Hinc proprias renovat vires, hinc fuſa per artus
Aſpera ſecretum ſervant alimenta vigorem
Hoc abſente perit triſti morientia torpent
Membra fame, venaſque ſitis conſumit apertas."

Pliny ſays, " Sola hæc materia (ferrum) vires ab eo lapide, accipit retinetque longo tempore, aliud apprehendens ferrum, ut annulorum catena ſpectetur interdum, quod imperitum vulgus ferrum appellat vivum.

We think that theſe obſervations authoriſe us to ſay, that in reducing a loadſtone into a convenient ſhape, as much as poſſible of the operation ſhould be performed by grinding them with emery, in cavities made in large blocks of *hammered* iron. The magnetiſm induced on the iron muſt be favourable to the conſervation of that in the loadſtone; which, we are perſuaded, is rapidly diſſipated by the tremors into which this very elaſtic ſubſtance is thrown by the grinding with coarſe powders in any mould but iron. We imagine, that the cutting off ſlices by the lapidaries wheel has the ſame bad effect.

57. Not only will a magnet lift a greater lump of iron by its north pole, when another lump is applied to its ſouth pole, but it will lift a greater piece of iron from an anvil than from a wooden table: for the magnet induces the properly diſpoſed polarity, not only in the iron which it lifts, but alſo in the anvil, or any piece of iron immediately beyond it. This is ſo diſpoſed as to increaſe the magnetiſm of the piece of iron between them; and therefore to increaſe their attraction. The magnetiſm induced on the anvil is alſo in part, and perhaps chiefly, induced by the intervening iron. Theſe experiments are extremely variable in their reſults.—Sometimes a ſmall magnet will pull an iron wire from a large and ſtrong one. Sometimes this will be done even by a piece of unmagnetic iron; and the reſults appear quite capricious. But they are accurately fixed, depending on the induced compound magnetiſm. Mr Æpinus has ſtated ſome of the more ſimple caſes, in which we can tell which magnet ſhall prevail. But the unfolding even of theſe caſes would take a great deal of room, and muſt be omitted here. Beſides, we are too imperfectly acquainted with the degree of magnetiſm induced on the various parts of an iron rod, and the degree of magnetiſm inherent in the various parts of the magnets, to be able to ſay, with certainty, even in thoſe ſimple caſes, on which ſide the ſuperiority of attraction will remain.

58. Making of artificial magnets.

We may now proceed to deduce from this theory (for ſo it may juſtly be called, ſince all is reduced to one fact) the proceſs for communicating magnetiſm to bodies fitted for receiving and retaining it; that is, the method of making artificial magnets. We ſhall not employ much time on this, becauſe the moſt approved methods have been delivered at length in the article MAGNETISM of the *Encyclopædia;* and therefore we ſhall juſt make ſuch obſervations on them as ſerve to confirm, or to perfect them by the theory. We acknowledge, that we do not know the internal proceſs by which magnetiſm is induced, nor even in what this magnetiſm conſiſts. All that we know is, that the bringing the pole of a magnet near to any magnetiſable matter, produces a magnetiſm of the kind oppoſite to that of the pole employed. We know that this is the caſe with both poles, and that it obtains at all the diſtances where magnetiſm is obſerved. We know that the action of one pole is contrary to that of the other; that is, it counteracts the other, prevents it from producing its effect, and deſtroys it when already produced: and we know, that the production of theſe effects reſembles in its reſult the protruſion of ſomething fluid through the pores of the body, conſtipating it in all remote parts; as if the virtue of a pole reſided in this moveable matter. This is nearly all that we know of it; and by theſe facts and notions we muſt judge of the propriety and effect of all the proceſſes for magnetiſing bodies.

The moſt ſimple method of magnetiſing a ſteel bar, is to apply the north pole of a magnet to that end which we wiſh to render a ſouth pole. Attention to the effects of this application is very inſtructive. Have in readineſs a very ſmall compaſs needle, turning on its pivot. It ſhould not exceed half an inch in length, and ſhould be as hard tempered as poſſible, and ſtrongly impregnated. Immediately after the application of the magnet, carry the needle along the ſide of the bar. If the bar be long, and very hard, we ſhall obſerve a ſouth polarity at the place of contact; a north polarity at a ſmall diſtance from it; beyond this a weak ſouth polarity; then a weak and diffuſed north polarity, &c.; toward the remote end the polarity will be found very uncertain. The ſame thing may be diſcovered by laying a ſtiff paper on the bar, and ſprinkling iron filings over it, and then gently tapping the paper, to make them arrange themſelves in curve lines; which will point out the various poles, and ſhew whether they are diffuſed or conſtipated. It is very amuſing and inſtructive to obſerve the progreſs of this impregnation. In a few minutes after the firſt application of the magnet, we ſhall perceive the ſtate of magnetiſm very ſenſibly changed. The north pole will be farther from the magnet, and will be more diſtinct; the ſouthern polarity will alſo be protruded, and may appear for a moment at the remote extremity. The change advances; but the progreſs is more ſlow, and at laſt is inſenſible. When the bar is not harder than the temper of a cutting tool, the proceſs is ſoon over; and if the bar is but ſix or eight inches long, the remote end ſhews the north polarity in a very few minutes. When the bar is very hard, the progreſs of impregnation is greatly expedited by ſtriking it ſo as to make it ſound. If it be ſuſpended by a ſtring in a vertical poſition, and the magnet applied to its lower end, the ſtriking it with a key will make it ring; and in this way make the progreſs of magnetization very quick: but it does not allow it to acquire all the magnetiſm that can be given it by a very ſtrong magnet.

But this is a bad way of impregnation. It is ſeldom that uniform magnetiſm, with only two poles, and thoſe of equal ſtrength, can be given. Even when there are but two, the remote pole is generally diffuſed, and therefore feeble. It is much improved by employing two magnets, one at each end. And if the bar is not more than ſix or eight inches long, and good magnets are employed, the magnetiſm is abundantly regular. This, accordingly, is practiſed for the impregnation of dipping needles, which muſt not be touched, leſt we diſturb the centre of gravity of the needle. But in all caſes, this method is tedious, and does not give ſtrong magnetiſm.

The method which was uſually practiſed before we had obtained a pretty clear knowledge of magnetiſm, was to apply the pole of a magnet to one end of the bar, and paſs it along to the other end, preſſing moderately. This was repeated ſeveral times on both ſides of the bar, always beginning the ſtroke at the ſame end as at firſt, and, in bringing the magnet back to that end, keeping it at a diſtance from the bar. The effect of this operation was to leave the end at which we began the ſtroke poſſed of the polarity of the pole employed.

A general notion of the proceſs may be given as follows, obſerving, however, that there occur very many great and capricious anomalies. When the north pole N (fig. 16.) of the magnet A is ſet on the end C of the bar CBD, a ſouth pole is produced at C, and a north pole at D, when the length of the bar is moderate. As the magnet advances ſlowly along the bar, the ſouthern polarity at C firſt increaſes, then diminiſhes, and vaniſhes entirely when N has arrived at a certain point *a*; after which, a northern polarity appears at C, and increaſes during the whole progreſs of the magnet. In the mean time, the northern polarity firſt produced at D increaſes till the magnet reaches a certain point *e*, then diminiſhes, vaniſhes when the magnet reaches a certain point *f*; after which, a ſouthern polarity appears at D, which increaſes till the magnet reaches D. Mr Brugmann, who firſt attended minutely to theſe particulars (for Gilbert ſpeaks of them pointedly), calls *a* and *f* *points of indifference*, and *e* the *culminating* point of the pole D, and *i* the culminating point of the pole C. Hardly can any general rule be given for the ſituation of theſe points, nor even for the order in which they ſtand; ſo great and capricious are the anomalies in an amazing ſeries of experiments narrated by Brugmann and by Van Swinden. Repeating the operation, and beginning at C, the northern polarity there is weakened (ſometimes deſtroyed), then reſtored, and continually increaſed during the reſt of the ſtroke. The ſouthern polarity at D is alſo firſt weakened, and ſometimes deſtroyed; then reſtored, and finally augmented. The points *i*, *a*, *e*, *f*, change their ſituations, and frequently their order.

Van Swinden has attempted to deduce ſome general laws from his immenſe liſt of experiments, avoiding every conſideration of a hypotheſis, or the leaſt conjecture by what means theſe faculties are excited. But though we have peruſed his inveſtigation with care and candor, we muſt acknowledge, that we have not derived any knowledge which can help us to predict the reſult of particular modes of treatment with any greater preciſion than is ſuggeſted by a ſort of common ſenſe, aided (or perhaps perverted) by a vague notion, that theſe energies reſide in ſomething, which avoids the pole of the ſame name, carrying along with it this diſtinctive energy or polarity. This conception tallies perfectly with theſe obſervations of Brugmann and Van Swinden; and admits of all the anomalies in the ſituation of Brugmann's indifferent and culminating points, if we only ſuppoſe that this motion is obſtructed by the particles of the body. We muſt leave this to the reflection of the reader, who will *gueſs* how, when the magnet is between C and *i*, this ſubſtance, avoiding the pole N of the magnet, eſcapes below it, and goes toward the farther end. As the magnet advances, it drives ſome of this back again, &c. &c. This is gratuitous; but it aids the fancy, which, without ſome conception of this kind, has no object of ſteady contemplation. We have no thought when we ſpeak of the generating at C, or *a*, or *e*, a faculty of ſome kind, by the exertion of the ſame faculty in N. The conception is too abſtracted, and much too complex. We muſt content ourſelves with knowing, that N produces a ſouth pole immediately under it, and a north pole everywhere elſe, or endeavours to do ſo. It is unneceſſary to inſiſt longer on this method: Common ſenſe ſhews it to be a very injudicious one.

This method was greatly improved by beginning the friction at the centre. Apply the north pole at the centre or middle of the bar, and draw it over the end intended for the ſouth pole. Having done this ſeveral times to one end on both ſides, turn the magnet, applying its ſouth pole to the middle of the bar, and drawing it ſeveral times over the end intended for the north pole.

It was ſtill more improved by employing two magnets at once, placed as in fig. 17. on the middle B of the bar, and drawing them away from each other, over the ends of it, as ſhewn by the directing darts, and repeating this operation. It is plain that, as far as we underſtand any thing of this matter, this proceſs muſt be much preferable to either of the former two. The magnets A and E certainly concur in producing a properly diſpoſed magnetiſm on all that lies between them; and therefore on the whole bar at the end of each ſtroke. The end C muſt become a north, and D a ſouth pole. Still, however, as the ſtroke goes on to the point of indifference, each magnet tends to weaken the polarity of the parts ſituated beyond it.

This method continued to be practiſed till about the year 1750. Mr Canton, availing himſelf of the experiments of Mr Mitchell of Cambridge, publiſhed his method by the DOUBLE TOUCH as it is called. See *Monthly Review* for 1785.

59
Method of double touch.

We need not repeat what has been detailed in the *Encyclopædia*, MAGNETISM, p. 440, &c. and ſhall only make ſome obſervations on the peculiar advantages of this proceſs, as preſcribed by Mitchell, Canton, and improved by Mr Antheaume, in his memoir *ſur les Aimans Artificiels* 1766, which was crowned by the Academy of Sciences. (See alſo diſſertations on the ſubject by *Le Maire and Du Hamel*, 1745).

There is an evident propriety in the arrangement invented by Mr Mitchell, repreſented in fig. 18. The magnetiſm induced on the two pieces of ſoft iron AD and BC is an excellent method for *ſecuring* every acceſſion of magnetiſm to either of the bars. A good deal depends on the proper ſize and length of theſe pieces; and our ignorance of the interior proceſs obliges us to have recourſe to experiment alone for aſcertaining this. Whatever circumſtances induce the ſtrongeſt magnetiſm on thoſe pieces of iron, will cauſe them to produce the greateſt effect on the ſteel bars; and this will be indicated by a greater attraction. Therefore that diſtance will be the beſt which enables two bars AB and DC to lift the greateſt weight hung on the piece AD or BC. When we impregnated bars whoſe breadth was about one-tenth of their length, and their thickneſs about one-half of their breadth, we found, that if AD was about one-fourth, or nearly one third, of AB, they carried more than if it was either much longer or much ſhorter. Mr Antheaume's addition of the two great bars of iron E and F makes a ſenſible improvement of the *beginning* of the impregnation, when very weak magnets are employed; but did not ſeem to us to be of any farther ſervice on the table. This is agreeable to any theory which can be eſtabliſhed by what we have ſaid hitherto.

The method of employing the magnets A and E (fig. 19.), preſcribed by Mitchell and Canton, is extremely judicious. The meeting of the diſſimilar poles at top increaſes the magnetiſm of each. The two diſſimilar poles F and G, certainly tend to give a regular and proper magnetiſm to the part FG of the bar which lies between them; and this is the caſe on whatever part of the bar they are placed. But each pole tends to deſtroy the preſent magnetiſm of what lies between it and the pole of the bar on that ſide. But mark—they tend to produce the deſired magnetiſm on what lies between them with the *ſum* of their forces; while each tends to deſtroy the magnetiſm of the part without it by the *difference* only of their forces. Therefore, on the whole, as they are moved to and fro along the bar, and the foremoſt one even made to paſs over the end of it a little way, they always add to the magnetiſm already acquired. This conſideration ſeems to enjoin ſetting F and G extremely near each other; for this ſeems to increaſe the ſum, and to diminiſh the difference of their action. But it may be a queſtion, Whether we gain more by ſtrongly magnetiſing a very ſmall part during the very ſhort while that the magnets paſs over it, or by acting on more of the bar at once, and continuing a weaker action for a longer while on this larger portion. Mr Æpinus adds another conſideration depending on his notion of the internal proceſs; but we defer this to another opportunity. The ſafeſt direction ſeems to be, to place them at the diſtance which enables them to lift the greateſt weight. They are then undoubtedly acting with the greateſt effect.

Mr Antheaume directs to place the touching magnets as in fig. 20. for a reaſon to be mentioned afterwards. Mr Æpinus alſo recommends it for reaſons founded on his own hypotheſis. We muſt ſay, that, in our trials, we have found this method very ſenſibly ſuperior, eſpecially in the latter parts of the operation when the reſiſtance to farther impregnation becomes nearly a balance for the accumulating power of the magnets; and we conſider this as no inconſiderable argument for the juſtice of Mr Æpinus's hypotheſis.

The great advantage of this method is the regularity of the magnetiſm which it produces. We never find more than two poles; and when the bars are hard, and of uniform texture, the polarity is very little diffuſed, and ſeemingly confined to a very ſmall ſpace at the very extremities of the bar. This is indeed a prodigious advantage in point of ſtrength. It is no leſs ſo in order to fit the magnets for experiments on the law of magnetic action; for the latitude which the diffuſed condition of the poles gives in the ſelection of the points from which the diſtances are to be computed, has hitherto hindered us from pronouncing on the law of magnetic action with the preciſion of which we think it fully ſuſceptible. This method alſo is the only one by which we have been able to impregnate two bars joined end to end, conſidering them as one bar. We have ſometimes (though very rarely) ſucceeded in this; ſo that when filings were ſtrewed over them, the appearance could not be diſtinguiſhed from a ſingle bar.—*N. B.* Yet even in this caſe, in one experiment with two bars of ſix inches long, treated as one, when it could not be diſtinguiſhed, either by the appearance of the filings, or by going round it very near with a compaſs needle, a very ſmall compaſs needle diſcovered a neutral point, and a reverſion of polarity ſimilar to fig. 14. at F, ſhewing that it was really acting as two bars. Perhaps it muſt always be ſo; and this queſtion is of conſiderable importance in the eſtabliſhment of any theory of the internal proceſs.

It deſerves remark, that, in order to ſucceed in this attempt, a very conſiderable preſſure is neceſſary. We were obliged to clean the ends of the bars very carefully, and to force the frame of bars and ſoft pieces of iron ſtrongly together by wedges, in the manner of a form of types. We thought that wetting the ends of the bars with pure water aided the experiment; and we are *very certain* that oil not only greatly obſtructed it, but even ſenſibly impeded the common proceſs. We had put a ſingle drop of oil on a pair of bars which we were touching in the common Cantonian method, that the magnets might be more eaſily drawn along them; but we were ſurpriſed at finding that we could not give a ſtrong impregnation. The oil undoubtedly prevents the cloſe contact. We found the fineſt gold leaf produce the ſame effect in a great degree; as alſo talc, of which a ſquare inch weighed $\frac{1}{24}$th of a grain. We do not infer any thing like obſtruction to the paſſage of ſomething material, but rather aſcribe it to mere diſtance; although we are of opinion, that in the impregnation of two contiguous bars, ſo that the magnetiſm (whatever it is) is diſpoſed *preciſely* as in one bar, there *is* a material transference. But we ſhall ſpeak of this in its due place.

It is not unworthy of remark, that we found bars to acquire more powerful magnetiſm when pretty well poliſhed than when rough. But we alſo found, that bars conſiderably rough acquired the firſt degrees of it much more expeditiouſly than thoſe which are ſmooth; although we never could bring them to that high degree of magnetiſm that the ſame bars acquired after they had been poliſhed. We think it probable, that the tremors, occaſioned by the rough and harſh ſurfaces of the hard ſteel, are the cauſes of this phenomenon.

Some more obſervations on this method of the double touch will be made afterwards, when we conſider the hypotheſis of Mr Æpinus: and we conclude the preſent ſubject, by attempting to explain ſome puzzling appearances which frequently occur in making artificial magnets.

60 Difficultie explained

A bar touched by a very ſtrong magnet has been ſaid by Muſchenbroek to be impaired by going over it with a weaker magnet. If it had been made as ſtrong as poſſible, the weaker magnet, when paſſed over it in the way practiſed by Muſchenbroek, muſt *firſt* deſtroy part of this magnetiſm; and having done ſo, it is unable to raiſe it anew to the ſame degree of vigour.

Yet (ſays Muſchenbroek with ſurpriſe) a large bar of common iron has greatly improved the magnet. A very large piece of iron *muſt* do this (eſpecially if ſhaped like a horſeſhoe, and applied with both heels), if the bar be not already at its maximum.

It was thought wonderful, that, in the method of double touch, not only was the magnetiſm of the magnets employed not impaired, but, beginning with two magnets, whoſe power is almoſt inſenſible, and repeating the operations in the preciſe manner deſcribed by Mitchell or Canton, not only the bars intended to be made magnetical, but alſo the magnets employed, may be brought to their higheſt poſſible ſtate of magnetiſm.

This is in evident conformity to the general facts of induced magnetiſm, and affords the ſtrongeſt proof that nothing is communicated in this operation, but that powers reſiding in the bars are excited, or brought into action. The manipulation merely *gives occaſion* to this action, as a ſpark of fire kindles a city.

61 Explanation of the beginning of Savery, Canton, and Antheaume's proceſs.

There ſtill remain ſome circumſtances of this method, as practiſed by Savery, Canton, and Antheaume, which are extremely curious and important.

Mr Savery had obſerved a ſmall bit of ſteel acquire very ſenſible magnetiſm by lying long in contact with the lower end of a great window bar. Telling this to a friend, he was, for the firſt time, informed that this had been long obſerved, and that Dr Gilbert had made ſome curious inferences from it. Mr Savery wanted ſome magnets, and was at a diſtance from town. Reflecting, like a philoſopher, on what he had heard and obſerved, he ſaw here a ſource of magnetiſm which he could increaſe, in the manner commonly practiſed in making magnets. He placed the bar AB (fig. 21.) to be magnetiſed between two great bars of common iron C and D, placing all the three in the magnetical direction. He took another bar EF, and put two little pieces of iron, like the armour of a loadſtone, on its ends; and with thoſe ends he rubbed the bar AB, rubbing the upper half of it with the end F, and the lower with the end E. The reſult of this was a very briſk magnetiſm in a few minutes, which, by various well deviſed alternations, he brought to its higheſt degree. His numerous experiments publiſhed in the Philoſophical Tranſactions in 1746, contain much curious information, highly deſerving the attention of the philoſophers. Mr Canton, proceeding on the ſame principle, that bars of iron, which have been long in a vertical poſition, acquire an efficient magnetiſm, begins his operations by placing his ſteel bar on the head of a kitchen poker, and rubs it with the lower end of a pair of kitchen tongs. Mr Antheaume adheres more ſtrictly to the inferences from the principle of terreſtrial magnetiſm, and repeats preciſely the previous diſpoſition of things practiſed by Mr Savery, placing his little ſteel bar AB (fig. 22.) between two great bars C and D of common iron, and arranging the whole in the magnetic direction. Then, proceeding moſt judiciouſly on the ſame principle, he greatly improves the proceſs, by employing two bars EF and GH for the touch, holding them about an inch apart, inclined about 15° to the bar AB. It is plain, that the lower end of each of theſe five bars is a north pole, and the upper end a ſouth pole. Therefore the poles F and G concur in giving the proper magnetiſm to the portion FG of the ſteel bar which is between them; and by rubbing it with theſe poles up and down, overpaſſing each extremity about half an inch, he muſt ſoon give to the bar AB a regular magnetiſm; weak, perhaps, but to be afterwards increaſed in the Cantonian method, on a horizontal table. In this manner did Mr Antheaume make magnets of very great ſtrength in 1766. See his *Diſſertation* already quoted.

62 Gilbert's terreſtrial magnetiſm.

Theſe obſervations naturally bring us to the Physiologia Nova de Magnet et corporibus Magneticis of Dr Gilbert; a diſcovery which the ſagacious Kepler claſſes among the greateſt in the annals of ſcience.

It could not be that a phenomenon ſo general, and ſo intereſting and important as the natural polarity of magnetic bodies, would be long known without exciting curioſity about its cauſe. Accordingly the philoſophers of the 16th century ſpeculated much about it, and entertained a variety of opinion, if that can be called an opinion which can hardly be ſaid to expreſs a thought. We have in *Marſigli Ficino* a ſhort notice of many of theſe opinions. Some maintained that the needle was directed by a certain point in the heavens, as if that were ſaying more than that it always pointed one way. Others, with more appearance of reaſoning, aſcribed the direction to vaſt magnetic rocks. But all this was without giving themſelves the trouble of trying to aſcertain what ſituation of ſuch rocks would produce the direction that is obſerved. Fracaſtori was, if we miſtake not, the firſt who thought this trouble at all neceſſary; and he obſerves very ſenſibly, that if thoſe rocks are ſuppoſed to be in any place yet viſited by navigators, and if they act as loadſtones do (a circumſtance which he ſays muſt be admitted, if we attempt to explain), the direction of the needle will be very different from what we know it to be. He therefore places them in the inacceſſible polar regions, but not in the very pole. Norman, the diſcoverer of the dip of the mariner's needle, or of the true magnetic direction, was naturally led by his diſcovery to conceive the directing cauſe as placed in the earth; becauſe the north point of the needle, in every part of Europe, points very far below the horizon. But although he calls the treatiſe in which he announces his diſcovery the *New Attractive*, he does not expreſs himſelf as ſuppoſing the needle to be attracted by any point within the earth, but only that it is always directed to that point.

It is to Dr Gilbert of Colcheſter that we owe the opinion now univerſally admitted, that magnetic polarity is a part of the conſtitution of this globe. Norman had, not long before, diſcovered, that if a ſteel needle be very exactly balanced on a horizontal axis, like the beam of a common balance, ſo that it would retain any poſition given it, and if it be then touched with a magnet, and placed on its axis in the magnetic meridian, it is no longer in equilibrio, but (at London) the north point of it will dip 72 or 73 degrees below the horizon. He did not, however, publiſh his diſcovery till he had obtained information how it ſtood in other parts of the world. The differences in the variation in different places naturally ſuggeſted the neceſſity of this to him. Being a maker of mariners compaſſes, and teacher of navigation in London, he had the faireſt opportunities that could be deſired, by furniſhing dipping needles to ſuch of the navigators, his ſcholars, as he knew moſt able to give him good information. And the accounts which he received made his diſcovery, when announced to the world, a very complete thing; for the commanders of ſhips engaged in long voyages, and particularly to China, informed him that, in the vicinity of the equator, his dipping needles remained parallel to the horizon, but that in coming toward the north pole, the north end of the needle was depreſſed, and that the ſouth end dipped in like manner at the Cape of Good Hope, and in the Indian Ocean; that the needle gradually approached the horizontal poſition as the ſhip approached the equator, but that in coming to the north of it at Batavia, the north point again dipped, and at Canton was ſeveral degrees below the horizon.

On theſe authorities, Norman boldly ſaid that, in the equatoreal regions, the needle was horizontal, and that either end dipped regularly as it approached either pole; and that in the poles of the earth, the needle was perpendicular to the horizon. He therefore announced this as a diſcovery, not only ſingularly curious, but alſo of immenſe importance; for by means of a dipping needle the latitude of a ſhip at ſea may be found without ſeeing the ſun or ſtars.

Dr Gilbert, comparing this poſition of the compaſs needle with the poſitions which he had obſerved ſmall needles aſſume in his numerous experiments in relation to a magnet, as we have deſcribed at great length, was naturally led to the notion of the earth's being a great loadſtone, or as containing one, and that this arranged the dipping, or, in general, the mariner's needle, in the ſame manner as he obſerved a great magnet arrange a ſmall needle poiſed on its pivot. He therefore compoſed his *Phyſiologia Nova de Magnete*, et *de Tellure magno Magnete*; in which he notices ſo many points of reſemblance to the directive power of a magnet, that the point ſeems no longer to admit of any doubt. Dr Gilbert's theory may be thus expreſſed:

All the phenomena of natural magnetiſm are analogous to what we ſhould obſerve, if the earth were a great magnet, having its poles near the poles of the earth's equator, the north pole not far from Baffin's Bay, and the ſouth pole nearly in the oppoſite part of the globe. A dipping needle, under the influence of this great magnet, muſt arrange itſelf in a plane which paſſes through the poles of the magnet, the poſition of which plane is indicated (at leaſt nearly) by the ordinary compaſs needle; and it will be inclined to the horizon ſo much the more as we recede from the equator of the great magnet.

This opinion of Dr Gilbert was not leſs ingenious than important; and if firmly eſtabliſhed, it furniſhes a complete theory of all the phenomena of magnetiſm. But obſervations were neither ſufficiently numerous in the time of Dr Gilbert, nor ſufficiently accurate, to enable that great genius to aſſign the poſition of this great magnet, nor the laws of its action. The theory was chiefly founded on the phenomena of the dipping needle; phenomena which might have been unknown for ages, had the firſt notice of them fallen into any other hands than Norman's. They are not, like thoſe of variation, which might be made by any ſailor. They require for their exhibition a dipping needle, and the attention to circumſtances which can occur only to a mathematician. A dipping needle is to this day, notwithſtanding all our improvements in the arts, one of the moſt delicate and difficult taſks that an inſtrument maker can take in hand, and a good one cannot be had for leſs than twenty guineas. We are confident that ſuch as even Norman could make were far inferior to what are now made, and quite unfit for uſe at ſea while the ſhip is under ſail, although they may be tolerably exact for an obſervation of the dip in any port; and we preſume that it was ſuch obſervations only that Norman confided in. Our readers will readily conceive the difficulty of poiſing a needle with ſuch a perfect coincidence of its centre of gravity and axis of motion, and perfect roundneſs of this axis, that it ſhall remain in any poſition that is given it. Add to this, that a grain of duſt, inviſible to the niceſt eye, getting under one ſide of this axis, may be ſufficient for making it aſſume another poſition. It muſt alſo be a difficult matter to preſerve this delicate thing, ſo as that no change can happen to it. Beſides, all this muſt be performed on a piece of tempered ſteel which we are certain has no magnetiſm. Where can this be got, or what can inſure us againſt magnetiſm? Nor is there leſs difficulty in making the obſervations without great riſk of error. If the needle, moveable only in a vertical plane, be not ſet in the plane of a magnetic meridian, it will always dip too much. At London, where the magnetic direction is inclined 73° to the horizon, if it be in a plane 20° from the magnetic meridian, it will ſtand almoſt perpendicular; for it is eaſy to ſee, by the mechanical reſolution of forces, that it will take the poſition which brings it neareſt to the true magnetic direction. This, we think, is confirmed by ſeveral of Norman's and other old obſervations of dip. They are much greater than they have been ſince found in the ſame places.

63
Daniel Bernoulli's dipping needle.

Mr Daniel Bernoulli has given a very ingenious principle, by which we can make a dipping needle which will give a very accurate obſervation on ſhore; and being ſo eaſily executed, it deſerves to be generally known. Let a dipping needle be made in the beſt manner that can be done by a workman of the place, and balanced with ſome care before impregnation, ſo that we may be certain that when touched it will take nearly the true dip. Touch it, and obſerve the dip. Deſtroy its magnetiſm, and then alter its balance in ſuch a manner that, without any magnetiſm, it will arrange itſelf in the inclination of the obſerved dip. Now touch it again, giving it the ſame poles as before. It is plain that it will now approach exceedingly near indeed to the true dip, becauſe its want of *perfect* equilibrium deranged it but a few degrees from the proper direction. If this ſecond obſervation of the dip ſhould differ ſeveral degrees from the firſt, by the inaccurate firſt formation of the needle, it will be proper to repeat the operation. Very rarely indeed will the third obſervation of the dip vary from the truth half a degree.

Mr Bernoulli makes this ſimple contrivance anſwer the purpoſe of an univerſal inſtrument in the following ingenious manner. A very light braſs graduated circle EFG (fig. 23.) is fixed to one ſide of the needle, concentric with its axis, and the whole is balanced as nicely as poſſible before impregnation. A very light index CD is then fitted on the axis, ſo as to turn rather ſtiffly on it. This will deſtroy the equilibrium of the needle. If the needle has been made with perfect accuracy, and perfectly balanced, the addition of this index would cauſe it always to ſettle with the index perpendicular to the horizon, whatever degree of the circle it may chance to point at. But as this is ſcarcely to be expected, ſet the index at various degrees of the circle, and note what inclination the unmagnetic needle takes for each place of the index, and record them all in a table. Suppoſe, for example, that when the index is at 50, the needle inclines 46° from the horizon. If in any place we obſerve that the needle (rendered magnetic by lying between two ſtrong magnets), having the index at 50, inclines 46°, we may be certain that this is the dip at that place; for the needle is not deranged by the magnetiſm from the poſition which gravity alone would give it. As we generally know ſomething of the dip that is to be expected in any place, we muſt ſet the index accordingly. If the needle does not ſhew the expected dip, alter the poſition of the index, and again obſerve the dip. See whether this ſecond poſition of the index and this dip form a pair which is in the table. If they do, we have got the true dip. If not, we muſt try another poſition of the index. Noticing whether the agreement of this laſt pair be greater or leſs than that of the former pair, we learn whether to change the poſition of the index in the ſame direction as before, or in the oppoſite. The writer of this article has a dipping needle of this kind, made by a perſon totally unacquainted with the making of philoſophical inſtruments. It has been uſed at Leith, at Cronſtadt in Ruſſia, at Scarborough, and at New York, and the dip indicated by it did not in any ſingle trial differ 1½ degrees from other trials, or from the dip obſerved by the fineſt inſtruments. He tried it himſelf in Leith Roads, in a rough ſea; and does not think it inferior, either in certainty or diſpatch, to a needle of the moſt elaborate conſtruction. It is worthy of its moſt ingenious author, and of the public notice, becauſe it can be made for a moderate expence, and therefore may be the means of multiplying the obſervations of the dip, which are of immenſe conſequence in the theory of magnetiſm, and for giving us an accurate knowledge of the magnetical conſtitution of this globe.

64
Opinions concerning the great magnet contained in this globe.

This knowledge is ſtill very imperfect, owing to the want of a very numerous collection of obſervations of the dip. They are of more importance than thoſe of the horizontal deviations from the meridian. All that we can ſay is, that the earth acts on the mariner's needle as a great loadſtone would do. But we do not think that the appearances reſemble the effects of what we would call a good loadſtone, having the regular magnetiſm of two vigorous poles. The dips of the needle in various parts of the earth ſeem to be ſuch as would reſult from the action of an extremely irregular loadſtone, having its poles exceedingly diffuſed. The increaſe of the dip, as we recede from thoſe places where the needle is horizontal, is too rapid to agree with the ſuppoſition of two poles of conſtipated magnetiſm, whether we ſuppoſe the magnetic action in the inverſe ſimple or duplicate ratio of the diſtances, unleſs the great terreſtrial magnet be of much ſmaller dimenſions than what ſome other appearances oblige us to ſuppoſe. If there be four poles, as Dr Halley imagined, it will be next to impoſſible to aſcertain the poſitions of the dipping needle. It will be a tangent to one of the ſecondary magnetic curves, and theſe will be of a very intricate ſpecies. We cannot but conſider the diſcovery of the magnetic conſtitution of this globe as a point of very great importance, both to the philoſopher and to ſociety. We have conſidered it with ſome care; but hitherto we have not been able to form a ſyſtematic view of the appearances which gives us any ſatisfaction. The well informed reader is ſenſible, that the attempt by means of the horizontal or variation needle is extremely tedious in its application, and is very unlikely to ſucceed; at the ſame time it muſt be well underſtood. The two diſſertations by Euler, in the 13th and 22d volumes of the Memoirs of the Royal Academy at Berlin, are moſt excellent performances, and give a true notion of the difficulty of the ſubject. Yet, even in theſe, a circumſtance is overlooked, which, for any thing we know to the contrary, may have a very great effect. If the magnetic axis be far removed from the axis of revolution, as far, for example, as Mr Churchman places it, the magnetic meridians will be (generally) much inclined to the horizon; and we ſhall err very far, if we ſuppoſe (as in Euler's calculus) that the dipping needle will arrange itſelf in the vertical plane, paſſing through the direction of the horizontal or variation needle; or if we imagine that the poles of the great magnet are in that plane. We even preſume to think that Mr Euler's aſſumption of the place of his fictitious poles (namely, where the needle is vertical), in order to obtain a manageable calculus, is erroneous. The introduction of this circumſtance of inclination of the magnetic meridians to the horizon, complicates the calculation to ſuch a degree as to make it almoſt unmanageable, except in ſome ſelected ſituations. Fortunately, they are important ones for aſcertaining the places of the poles. But the inveſtigation by the poſitions of the dipping needle is incomparably more ſimple, and more likely to give us a knowledge of a multiplicity of poles. The conſideration of the magnetic curves (in the ſenſe uſed in the preſent article), teaches us that we are not to imagine the poles immediately under thoſe parts of the ſurface where the needle ſtands perpendicular to the horizon, nor the magnetic equator to be in thoſe places where the needle is horizontal; a notion commonly and plauſibly entertained. Unfortunately our moſt numerous obſervations of the dip are not in places where they are the moſt inſtructive. A ſeries ſhould be obtained, extending from New Zealand northward, acroſs the Pacific Ocean to Cape Fairweather on the weſt coaſt of North America, and continued through that part of the continent. Another ſeries ſhould extend from the Cape of Good Hope, up along the weſt coaſt of Africa to the tropic of Capricorn; from thence acroſs the interior of Africa (where it would be of great importance to mark the place of its horizontality) through Sicily, Italy, Dalmatia, the eaſt of Germany, the Gulph of Bothnia, Lapland, and the weſt point of Greenland. This would be nearly a plane paſſing through the probable ſituations of the poles. Another ſeries ſhould be made at right angles to this, forming a ſmall circle, croſſing the other near Cape Fairweather. This would paſs near Japan, through Borneo, and the weſt end of New Holland; alſo near Mexico, and a few degrees weſt of Eaſter Iſland. In this place, and at Borneo, the inclination of the magnetic plane to the horizon would be conſiderable, but we cannot find this out. It may, however, be diſcovered in other points of this circle, where the dip is conſiderable. We have not room in this ſhort account to illuſtrate the advantages derived from theſe ſerieſes; but the reflecting reader will be very ſenſible of them, if he only ſuppoſes the great magnet to be accompanied by its magnetic curves, to which the needle is always a tangent. He will then ſee that the firſt ſeries from New Zealand to Cape Fairweather, and the ſecond from Cape Fairweather round the other ſide of the globe, being in one plane, and at very different diſtances from the magnetic axis, muſt contain very inſtructive poſitions of the needle. But we ſtill confeſs, that when we compare the dips already

See Variation, *Encycl.*

known with the variations, they appear ſo irreconcileable with the reſults of an uniform regular magnetiſm, that we deſpair of ſucceſs. Every thing ſeems to indicate a multiplicity of poles, or, what is ſtill more adverſe to all calculation, an irregular magnetiſm with very diffuſed polarity.

Much inſtruction may ſurely be expected from the obſervations of the Ruſſian academicians and their eleves, who are employed in ſurveying that vaſt empire; yet we do not meet with a ſingle obſervation of the dip of the needle in all the bygone publications of that academy, nor indeed are there many of the variation.

65 And concerning the ſituation of its poles.

For want of ſuch information, philoſophers are extremely divided in their opinions of the ſituation of the magnetic poles of this globe. Profeſſor Krufft, in the 17th volume of the Peterſburgh Commentaries, places the north pole in lat. 70° N. and long. 23° W. from London; and the ſouth pole in lat. 50° S. and long. 92° E.

Wilcke of Stockholm, in his indication chart (*Swed. Mem.* tom. xxx. p. 218.), places the north pole in N. Lat. 75°, near Baffin's Bay, in the longitude of California. The ſouth pole is in the Pacific Ocean, in lat. 70° S.

Churchman places the north pole in lat. 59° N. and long. 135° W. a little way inland from Cape Fairweather; and the ſouth pole in lat. 59° S. long. 165° E. due ſouth from New Zealand.

A planiſphere by the Academy of Sciences at Paris for 1786, places the magnetic equator ſo as to interſect the earth's equator in long. 75°, and 155° from Ferro Canary Iſland, with an inclination of 12 degrees nearly, making it a great circle very nearly. But we are not informed on what authority this is done; and it does not accord with many obſervations of the dip which we have collected from the voyages of ſeveral Britiſh navigators, and from ſome voyages between Stockholm and Canton. Mr Churchman has given a ſketch of a planiſphere with lines, which may be called parallels of the dip. Thoſe parts of each parallel that have been aſcertained by obſervation are marked by dots, ſo that we can judge of his authority for the whole conſtruction. It is but a ſketch, but gives more ſynoptical information than any thing yet publiſhed. The magnetic equator cuts the earth's equator in long. 15°, and 195° E. from Greenwich, in an angle of nearly 17 degrees. The circles of magnetic inclination are not parallel, being conſiderably nearer to each other on the ſhort meridian than on its oppoſite. This circumſtance, being founded on obſervation, is one of the ſtrongeſt arguments for the exiſtence of a magnet of tolerable regularity, as the cauſe of all the poſitions of the compaſs needle; for ſuch *muſt* be the poſitions of the circles of equal dip, if the axis of this magnet is far removed from the axis of rotation, and does not interſect it.

66. Now, if the ſituation of the poles be any thing near the average or medium of theſe determinations, and if we form all our notions by analogy, comparing the poſitions of the compaſs needle in relation to the great terreſtrial magnet, with the poſitions aſſumed by a ſmall needle in the neighbourhood of a magnet, we muſt conclude, that the magnetical conſtitution of this globe has little or no reference to its regular external form. The axis of the magnet is very far removed from that of the globe (at leaſt 1500 miles), and is not nearly parallel to it, nor in the ſame plane. It required the ſagacity and the ſkill of a Euler to ſubject ſuch anomalous magnetiſm to any rules of computation; and every perſon qualified to judge of the ſubject muſt allow his diſſertation in the 13th volume of the Berlin Memoirs to be a work of wonderful reſearch. It is a very agreeable thing to ſee ſuch a conformity between the lines which expreſs the regular magnetiſm of Euler's diſſertation, and the lines drawn by Dr Halley from obſervation, and which appeared to himſelf ſo capricious, that he deſpaired (notwithſtanding his conſummate ſkill in geometry) of their ever being reduced to a mathematical and preciſe ſyſtem.

67 Confirmations of Dr Gilbert's phyſiology.

Without detracting from the merit of Dr Gilbert, we may preſume to ſay that his notion of the earth's being a great magnet was not, in his mind, more than a ſagacious conjecture, formed from a very general and even vague compariſon. Yet the compariſon was ſufficiently good to give him great confidence in his opinion that the action of this great magnet, in perfect conformity to what we obſerve in our experiments with magnets, is the ſource of all the magnetiſm that we obſerve. If there was nothing elſe in proof of the juſtneſs of his theory, it is abundantly proved by the beautiful experiment of Mr Henſhaw, mentioned in the article VARIATION, *Encycl.* p. 621. col. 2. An iron bar held nearly upright, attracts the ſouth end of a compaſs needle with its lower end; and if that end of the bar be kept in its place, and the bar turned round till it becomes the upper end, the ſouth point of the needle immediately turns away from it, and the north end is now attracted. This experiment may be perfectly imitated with artificial magnetiſm.

Having ſupported a large magnet SAN (fig. 24.), ſo that its ends are detached from ſurrounding bodies, place a ſmall needle B (poiſed on its pivot) about three inches below the north pole N of the magnet, and in ſuch a ſituation that its polarity to the magnet may be very weak. Take now a ſmall piece of common iron, and hold it in the poſition repreſented at C. Its lower end becomes a north pole, attracting the ſouth pole of the needle. Keeping this in its place, turn round the piece of iron into the poſition D; the ſouth pole of B will now avoid it, and the north pole will be attracted. We directed the needle to be ſo placed, that its polarity, in relation to the magnet, may be weak. If it be ſtrong, it may act on the end of C or D like a magnet, and counteract the magnetiſm induced on C or D by vicinity to A.

An anonymous writer in the Philoſophical Tranſactions, N° 177. Vol. XV. relates ſeveral obſervations made during a voyage to the Eaſt Indies, which are quite conformable to this. A few leagues northweſt from the iſland Aſcenſion, the ſouth point of the compaſs needle hardly ſhewed any tendency to or from the lower end of an iron bar. It ſeemed rather to avoid the upper end; it was not in the leaſt affected by the middle of the bar; but when the bar was laid horizontal, in the magnetic direction, its two ends affected the diſſimilar ends of the compaſs needle very ſtrongly; but when horizontal, and lying at right angles to the magnetic direction, its polarity was altogether indifferent.

As the other phenomena of induced artificial magnetiſm have the ſame reſemblance to the phenomena of natural magnetiſm, a bar which has remained long in the vicinity of a magnet acquires magnetiſm (permanent) in the ſame way, and modified by the ſame circumſtances, as in natural magnetiſm. Hammering a bit of common iron in the immediate vicinity of a magnet, gives it very good magnetiſm. Expoſing a red hot bar to cool in the neighbourhood of a magnet has the ſame effect. Alſo quenching it ſuddenly has the ſame effect. Quenching a ſmall red hot ſteel bar between two magnets, was found by us to communicate a much ſtronger magnetiſm than we could give it by any other method. Its form indeed was very unfavourable for the ordinary method of touching; for it conſiſted of two little ſpheres connected by a ſlender rod, and could ſcarcely be impregnated in any other way than by placing it for a very long while between magnets. In all theſe experiments, the polarity acquired is preciſely ſimilar to that acquired by the ſame treatment in relation to this ſuppoſed great terreſtrial magnet. In ſhort, in whatever manner we purſue this analogy in our experiments, we find the reſemblance moſt perfect in the phenomena.

We cannot but think, therefore, that this new phyſiology of the magnet by Dr Gilbert is well eſtabliſhed; and we think ourſelves authoriſed to aſſume it as a propoſition fully demonſtrated, that the earth is a great magnet, or contains a great magnet, the agency of which produces the direction of the magnetic needle, and all the magnetiſm which iron acquires by long continuance in a proper poſition. It is this which made us ſay, in the beginning of this article, that attraction and polarity were not confined to magnets, but were properties belonging to all iron in its metallic ſtate. We now ſee the reaſon why any piece of iron brought very near to another piece will attract it—both become magnetical, in conſequence of the agency of the great magnet; and their magnetiſm is ſo diſpoſed, that their mutual attractions exceed their repulſions. Alſo, why an iron rod, placed nearly in the magnetical direction, will finally arrange itſelf in that direction. Alſo, why the terreſtrial polarity of common iron is indifferent, and either end of the rod will ſettle in the north, if it have nearly that poſition at firſt. The magnetiſm induced by mere momentary poſition is ſo feeble as to yield to any artificial magnetiſm. As a moment was ſufficient for imparting it, a moment ſuffices for deſtroying it; and another moment will impart the oppoſite magnetiſm. But artificial magnetiſm requires more force for its production, and ſome of it remains when the producing cauſe is removed, and it does not yield at once to the contrary magnetiſm. That there is no farther difference appears from this, that long continued poſition gives determined and permanent magnetiſm, and that it is deſtroyed by an equally long continuance in the contrary poſition. It ſeems to be very generally true, that a magnet will carry more by its north than by its ſouth pole. It ſhould be ſo in this part of the world, becauſe the terreſtrial magnetiſm induced on the iron conſpires with the magnetiſm induced by the north pole of a magnet, but counteracts the magnetiſm induced by the ſouth pole.

The propriety of Mr Savery's, Mr Canton's, and Mr Antheaume's proceſſes for beginning the impregnation of hard ſteel bars is now plain, and the ſuperior effect of the two great bars of common iron in the propoſed method of Mr Antheaume. We cannot but take this opportunity of paying the proper tribute of praiſe to the ingenuity of Mr Savery. Every circumſtance of his proceſs was ſelected in conſequence of an accurate conception of magnetiſm, and the combination of this ſcience with Dr Gilbert's theory. His proceſs is the ſame with Antheaume's in every reſpect, except the circumſtance of the double touch borrowed from Mitchell and Canton. Theſe obſervations do not detract from the diſcernment of Mitchell and Canton, who ſaw in thoſe experiments what had eſcaped the attention of hundreds of readers.

68
Seeming objection deduced from the want of ſenſible attraction.

But there occurs an objection to this theory of Dr Gilbert, which was urged againſt it with great force. We obſerve no tendency in the magnet or compaſs needle toward this ſuppoſed magnet. An iron or ſteel bar is not found to increaſe its tendency downwards, that is, is not ſenſibly heavier, when its ſouth pole is uppermoſt in this part of the world. A needle ſet afloat on a piece of cork arranges itſelf quickly in the proper direction; but if continued ever ſo long afloat, it has never been obſerved to approach the north ſide of the veſſel. This is quite unlike what we obſerve in the mutual actions of magnets, or the action of magnets on iron. This objection appears to have given Dr Gilbert ſome concern; and he mentions many experiments which have been tried on purpoſe to diſcover ſome magnetical tendency. He gets rid of it as well as he can, by ſaying, that the directive power of a magnet extends much farther than its attractive power. He confirms this by ſeveral experiments. But Dr Gilbert had not ſtudied the ſimultaneous actions of the four poles, nor explained, by the principles of compound motion, how theſe produced all the poſſible poſitions of the needle. Indeed, the compoſition of mechanical forces was by no means familiar with philoſophers at the end of the 16th century. We ſee it now very diſtinctly. The polarity of the needle, or the force with which it turns itſelf into the magnetical poſition, depends on the difference between the *ſums* of the actions of each pole of the magnet on both the poles of the needle; whereas its tendency towards the magnet depends on the difference of the *differences* of thoſe actions (ſee n° 22, 25.). The firſt may thus be very great when the other is almoſt inſenſible. We ſee, that coarſe iron filings heap about the magnet very faſt, and that very fine filings approach it very ſlowly. Now, the largeſt magnet that we can employ, when compared with the great magnet in the earth, is but as a particle of the fineſt filings that can be conceived. This ſurely diminiſhes exceedingly, if it does not entirely annihilate the objection: but as we have heard it urged by many as an improbable thing, that a long magnet, kept afloat for many months (which has been done) ſhall not ſhew the *ſmalleſt* tendency towards the pole of the terreſtrial magnet, we think it deſerves to be conſidered with accuracy, and the queſtion decided in a way which will admit of no doubt.

69
This completely anſwered.

Let the very ſmall magnet C (fig. 25.) be placed near a great magnet A, and then near a ſmaller magnet B, in ſuch a manner that its polarity to both ſhall be the ſame; and then let us determine the proportion between the attractions of A and B for the ſmall magnet C.

This will evidently depend on the law of magnetic action. For greater ſimplicity of inveſtigation, we ſhall content ourſelves with ſuppoſing the action to be inverſely as the diſtance.

Let AN, = AS, = a; BN = b; Cn = c, AC = d, BC = δ; and let the abſolute force of A be to that of B at the ſame diſtance as m to 1.

The magnetic action being ſuppoſed proportional to $\frac{1}{d}$, we have,

1. Action of AN on C $s = \frac{m}{d-a-c}$.

2. ——— AN on C $n = -\frac{m}{d-a+c}$.

3. ——— AS on C $s = -\frac{m}{d+a-c}$.

4. ——— AS on C $n = \frac{m}{d+a+c}$.

5. The whole action $= \frac{8macd}{\overline{d^2-\overline{a+c}|^2}|^2 \times \overline{d^2-\overline{a-c}|^2}|^2}$.

6. If c be very ſmall in compariſon with a or b, the whole action of A is very nearly $= \frac{8macd}{\overline{d^2-a^2}|^2}$.

7. And the tendency of C to B is, in like manner, $= \frac{8bc\delta}{\overline{\delta^2-b^2}|^2}$.

The directive powers of A and B are at their maximum ſtate when C is placed with its axis at right angles to the lines AC or BC. In which caſe we have,

8. The directive power of A $= \frac{4ma}{d^2-a^2}$.

9. The directive power of B $= \frac{4b}{\delta^2-b^2}$.

When theſe directive powers are made equal, by placing C at the proper diſtances from A and B, we have,

10. $4ma : 4b$, or $ma : b = d^2-a^2 : \delta^2-b^2$
And $ma\delta^2 - mab^2 = bd^2 - ba^2$
$ma\delta^2 = b(d^2-a^2) + mab^2$.

11. $\delta^2 = \frac{b}{ma}(d^2-a^2) + b^2$.

12. $\delta = \sqrt{\frac{b}{ma}(d^2-a^2)+b^2}$.

Let the attractions of A and B for the very ſmall magnet C, when its polarity to both is the ſame, be expreſſed by the ſymbols α and β. We have.

$\alpha : \beta = \frac{8macd}{(d^2-a^2)^2} : \frac{8bc\delta}{(\delta^2-b^2)^2}$, which, by n° 10. is $= \frac{8(d^2-a^2)cd}{(d^2-a^2)^2} : \frac{8(\delta^2-b^2)c\delta}{(\delta^2-b^2)^2} = \frac{d}{d^2-a^2} : \frac{\delta}{\delta^2-b^2}$, $= bd : ma\delta$; that is,

13. Attr^n of A : attr^n of B $= bd : ma\delta$.

As an example of this compariſon let us ſuppoſe the great terreſtrial magnet to be a thouſand times larger and ſtronger than the magnet whoſe attraction we are comparing with that of terreſtrial magnetiſm. Let us alſo ſuppoſe the diſtance from the pole of the great magnet to be ſmall, ſo that its attraction may be conſiderable. Let us make $d = 1200$, a being $= 1000$, and $b = 1$. Theſe are all very reaſonable ſuppoſitions. Subſtituting theſe values in the formula, we have attr^n of A : attr^n of B = 1 : 1000 very nearly; and therefore when the needle, when placed near a magnet, vibrates by its polarity as faſt as it does by natural magnetiſm, its tendency toward that magnet muſt be altogether inſenſible; for the diſproportion is incomparably greater than that of 1 to 1000, in the largeſt magnets with which we can make experiments. Obſerve alſo, that we have taken the caſe where the attractions are the ſtrongeſt, viz. when the magnet C is placed in the axis of A or B. In the oblique poſitions, tangents to the magnetic curves, the attractions are ſmaller, almoſt in any ratio.

We took the inverſe ratio of the diſtances for the law of action, only becauſe the analyſis was very ſimple. It is very evident, that the diſproportion will be ſtill more remarkable if the action be inverſely as the ſquare of the diſtance.

The objection therefore to the origin of the polarity of the compaſs needle, and of all other magnets, namely, the action of a great magnet contained in the earth, appears plainly to be of no force. We rather think that the want of all ſenſible attraction, where there is a briſk polarity, is a proof of the juſtneſs of the conjecture; for if the compaſs needle were arranged by the action of magnetic rocks, or even extenſive ſtrata, near the ſurface of the earth, the attractions would bear a greater proportion to the polarities. We have even obſerved this. A conſiderable maſs of magnetic ſtratum was found to derange the needle of a ſurveyor's theodolite at a conſiderable diſtance all around (about 140 yards). The writer placed the needle on a thin lath, which juſt floated it on water in a large wooden diſh, and ſet it in a place where it was drawn about 15 degrees from the magnetic meridian. It was left in that ſituation a whole night, well defended from the wind by a board laid on the diſh. Next morning it was found applied to that ſide of the diſh which was neareſt to the diſturbing rocks. It had moved about ſix inches. This was repeated three times, and each time it moved in the ſame direction (nearly), which differed conſiderably from the direction of the needle itſelf.

It is now plain that we may, with confidence, aſſume Dr Gilbert's theory of terreſtrial magnetiſm as ſufficiently eſtabliſhed. And, ſince we muſt certainly call that the north pole of the great magnet which is ſituated in the northern parts of the earth, and ſince thoſe poles of magnets which attract each other have oppoſite polarities, we muſt ſay, that what we call the north pole of a mariner's needle, or of any other magnet, has the ſouthern polarity.

70
The great magnet is the ſource of all natural magnetiſm.

We may now venture to go farther with Dr Gilbert, and to ſay that *all* the magnetiſm which we obſerve, whether in nature or art, is either the immediate or the remote effect of the action of the great magnet. As ſoft bars ſoon acquire a tranſient magnetiſm; as hard bars, after long expoſure, acquire a ſenſible and permanent magnetiſm—we muſt infer, that ores of iron, which are in a ſtate fit for impregnation, muſt acquire a ſenſible and permanent magnetiſm, by continuing, for a ſeries of ages, in the bowels of the earth. And thus the magnetiſm of loadſtones, which, till the diſcovery of the natural magnetiſm acquired by poſition, were the ſources of all our magnetical phenomena, is now proved to be a neceſſary conſequence of the exiſtence and agency of a great magnet contained in the bowels of the earth.

71 Loadſtones in the mine may have their poles in any poſition.

It ſeems to reſult from this theory, that, in theſe northern parts of the world, that part of every natural loadſtone that is at the extremity of the line drawn through the ſtone in the magnetic direction ſhould be its pole; and that the loadſtone when properly poiſed, ſhould of itſelf aſſume the very poſition which it had in the mine. Dr Gilbert complains of the inattention of miners (*rude hominum genus, lucro potius quam phyſicæ conſulentes*) to this important circumſtance. Once, however, he had the good fortune to be advertiſed of a great magnetic maſs lying in its matrix. He repaired quickly to the mine, examined it, and marked its points which were in the extremities of the magnetic line. When it was detached from its matrix, he had the pleaſure of finding its poles in the very places he expected. The loadſtone was of conſiderable ſize, weighing about 20 pounds.—Mr Wilcke gives in the Swediſh Commentaries ſeveral inſtances of the ſame kind.

But ſhould this always be the caſe? By no means. There are many circumſtances which may give the magnetiſm of a loadſtone a very different direction. We have found, that ſimple juxtapoſition to a magnet will ſometimes give a ſucceſſion of poles to a long bar of hard ſteel. The ſame thing may happen to an extenſive vein of magnetiſable matter. The loadſtone taken out of this vein may have been placed like that of a ſoft bar placed in the magnetic line, if lying in one part of the vein; if taken from another part of it, its polarity may be the very reverſe; and in another part it may have no magnetiſm, although completely fitted for acquiring it. It may have its poles placed in a direction different from all theſe, in conſequence of the vicinity of a greater loadſtone. As loadſtones poſſeſſed of vigorous magnetiſm are always found only in ſmall pieces, and in pieces of various ſizes and force, we muſt expect every poſition of their poles. The only thing that we can expect by theory is, that adjoining loadſtones will have their friendly poles turned toward each other, and a general prevalence of or tendency to a polarity ſymmetrical with that of the earth. The reader will find ſome more obſervations to this purpoſe in the article Variation, *Encycl.* p. 623. as alſo in Gilbert's treatiſe, B. III. c. 2. p. 121.

Nor ſhould all ſtrata or maſſes of iron ore be magnetical. We know that none are ſuſceptible of induced magnetiſm, but ſuch as are, to a certain degree, in the metallic ſtate. Such ores are not abundant. Nay, even all of ſuch ſtrata do not neceſſarily acquire magnetiſm by the action of the great magnet. If their principal dimenſions lie nearly perpendicular to the magnetic direction, they will not acquire any ſenſible quantity. A ſtratum in this country, riſing about 17 degrees to the N. N. W. will ſcarcely acquire magnetiſm. It may alſo happen, that the influence of the great magnet is counteracted by that of ſome extenſive ſtratum inacceſſible to man, by reaſon of its great depth.

72 Probable cauſe of their great natural vigour.

Thus we ſee, that all the appearances of the original magnetiſm of loadſtones are perfectly conſiſtent with the notion that they are effects of one general coſmical cauſe, the action of the great magnet contained in the earth, and that there is no occaſion to ſuppoſe this great magnet to differ, in its conſtitution or manner of action, from the ſmall maſſes of ſimilar matter called loadſtone. The only difficulty that preſents, itſelf is the great ſuperiority of magnetic force obſervable in ſome loadſtones over other maſſes of ores circumjacent, which are not diſtinguiſhable by us by any other circumſtance. We acknowledge ourſelves unable to ſolve this difficulty; for the magnetiſm of ſuch pieces is ſometimes incomparably ſtronger than what a bar of iron acquires by poſition; yet this bar is much more ſuſceptible than the ores which are fit for becoming loadſtones. Perhaps there is ſome chemical change which obtains gradually in certain maſſes, which aids the impregnation, in the ſame way that we know that being red hot deſtroys all magnetiſm, whether in a metal bar or in on ore. This ſeems to be confirmed by what we ſee in ſome old iron ſtanchions, which acquire the ſtrongeſt magnetiſm in thoſe parts of their ſubſtance which are combining themſelves with ingredients floating in the atmoſphere. That part which is caſed in the ſtone, and exfoliates and ſplits with ruſt, being converted into ſomething like what is called finery-cinder, becomes highly and permanently magnetic. Such peculiarities as theſe, operating for ages, may allow a degree of magnetical impregnation (in whatever this may conſiſt) to take place, to which we can ſee no reſemblance in our experiments. It would be worth while to place iron wires in a tube in the magnetic direction, which could be kept of a proper red heat, while it is converted into æthiops by ſteam. It is not unlikely that it would acquire a ſenſible and permanent magnetiſm in this way. It may be, that the little atoms, as they arrange themſelves in a ſort of cryſtaline or ſymmetrical form, may alſo arrange ſo as to favour magnetiſm. Were this tried in the vicinity of a ſtrong magnet, the effect might be more remarkable and preciſe. Perhape, too, while iron is precipitated in a metallic form from its ſolutions by another metal, ſomething of the ſame kind may happen. We know, that proper ores of iron, expoſed to cementation in a low red heat, in the magnetic direction, becomes magnetic.

73 Natural cauſes of the changes of the magnetic direction.

Notice has been taken in the *Encycl.* art. Variation, of the attempts of ingenious men to explain the change which is obſerved in all parts of the globe, on the direction of the mariner's needle, the gradual change of the variation. The hypotheſis of Dr Halley, that the globe which we inhabit is hollow, and incloſes a magnetic nucleus, moving round another axis, is not inconſiſtent with any natural law, if he did not ſuppoſe the interval filled up with ſome fluid. The action of the nucleus and ſhell on the intervening fluid would gradually bring the two to one common motion of rotation, as may be inferred from the reaſonings employed by Newton in his remarks on the Carteſian vortices.

Leaving out this circumſtance, there is only another cauſe which can affect, and muſt affect, the rotation of both; namely, the mutual action of the magnetic nucleus, and the maſſes of magnetic matter in the ſhell. If the axis of rotation of this nucleus be different from the line joining its magnetic poles, theſe poles will have a motion relative to the ſhell; and this motion may eaſily be conceived ſuch as will produce the changes of magnetic direction which we obſerve. It may even produce a motion of the northern magnetic pole in one direction, and of the ſouthern pole in the oppoſite direction; and this with the appearance of different periods of rotation, as ſuppoſed by Mr Churchman. We may here obſerve, by the way, that the change of magnetic direction in this country is not nearly ſo great as is commonly imagined. The horizontal needle has ſhifted its poſition about 35° at London ſince 1585; but the point of the dipping needle has not changed 10°. We may alſo obſerve, that when the pole of the central magnet changes its place, the magnetiſm of an extenſive ſtratum, influenced by it, may ſo alter its diſpoſition, as to change the poſition of the compaſs needle in the oppoſite direction to that of the change which the central magnet alone would induce on it.

But as motions have not yet been aſſigned to this nucleus, which quadrate with the obſerved poſitions of the needle, and as the very exiſtence of it is hypothetical, it may not be amiſs to examine, whether ſuch a change of variation may not be explained by what we know of the laws of magnetiſm, and of the internal conſtitution of this earth?

1. It is pretty certain, that the veins in which loadſtones are found are not parts of the great magnet. This appears from their having two poles while in the mine, and alſo from the very ſmall depth to which man has been able to penetrate. When we compare the poſitions of the dipping needle with thoſe of a ſmall needle near a magnet, we muſt infer, that the poles are very far below the ſurface.

Yet we know, that there are magnetiſable ſtrata of very great extent occupying a very conſiderable portion of the external covering. Though their bulk and abſolute power may be ſmall, when compared with thoſe of the great magnet, yet their greater vicinity to the needles on which obſervations are made, may give them a very ſenſible influence. In this way may a great deal of the obſerved irregularities of the poſitions of the needle be accounted for. In the Lagoon at Teneriffe, *Feuillée* obſerved the variation 13° 30′ weſt in 1724, while at the head of the iſland it was only 5°. The dip at the Lagoon was 63° 30′, greatly ſurpaſſing what was obſerved in the neighbourhood. Muller found, in the mountains of Bohemia, great and deſultory differences of declination, amounting ſometimes to 50°. At Mantua, the variation in 1758 was 12°; while at Bononia and Brixia it was nearly 18°. Great irregularities were obſerved by Goëte in the Gulph of Finland, eſpecially near the iſland of Suſſari, among ſome rocks: on one of theſe, the needle ſhewed no polarity. Captain Cook and Captain Phipps obſerved differences of 10°, extending to a conſiderable diſtance, on the weſt coaſts of North America. In the neighbourhood of the iſland Elba in the Mediterranean, the poſition of the needle is greatly affected by the iron ſtrata, in which that iſland ſo much abounds. In this country, there are alſo obſerved ſmall deviations, which extend over conſiderable tracts of country, indicating a great extent of ſtrata that are weakly magnetic. Since ſuch ſtrata receive their magnetiſm by induction, in a manner ſimilar to a bar of hard ſteel, and ſince we know that this receives it gradually, it may very probably happen, that a long ſeries of years may elapſe before the magnetiſm attains its ultimate diſpoſition.

Here, then, is a neceſſary change of the magnetic direction; and although it may be very different in different places, according to the diſpoſition and the power of thoſe ſtrata, there muſt be a general vergency of it one way.

2. It is well known that all metals, and particularly iron, are in a progreſs of continual production and demetallization. The veins of metals, and more particularly thoſe of iron, are evidently of poſterior date to that of the rocks in which they are lodged. Chemiſtry teaches us, by the very nature of the ſubſtances which compoſe them, that they are in a ſtate of continual change. This is another cauſe of change in the magnetic direction. Nay, we know that ſome of them have ſuddenly changed their ſituation by earthquakes and volcanoes. Some of the ſtreams of lava from Veſuvius and Ætna abound in iron. This has greatly changed its ſituation; and if the ſtrata from which it proceeded were magnetical, the needle in its neighbourhood muſt be affected. Nay, ſubterranean heat alone will effect a change, by changing the magnetiſm of the ſtrata. Mr Lievog, royal aſtronomer at Beſſeſtedt in Iceland, writes, that the great eruption from Hecla in 1783, changed the direction of the needle nine degrees in the immediate neighbourhood. This change was produced at a mile's diſtance from the frozen lava; and it diminiſhed to two degrees at the diſtance of 2½ miles. He could not approach any nearer, on account of the heat ſtill remaining in the lava, after an interval of 14 months.

All theſe cauſes of change in the direction of the mariner's needle muſt be partial and irregular. But there is another cauſe, which is coſmical and univerſal. Dr Halley's ſuppoſition of four poles, or, at leaſt, the ſuppoſition of irregular and diffuſed poles, ſeems the only thing that will agree with the obſervations of declination. We know that all magnetiſm of this kind (that is, diſpoſed in this manner) has a natural tendency to change. The two northern poles may have the ſame or oppoſite polarities. If they are the ſame, their action on each other tends to diminiſh the general magnetiſm, and to cauſe the centre of effort to approach the centre of the magnet. If they have oppoſite polarities, the contrary effect will be produced. The general magnetiſm of each will increaſe, and the pole (or its centre of effort) will approach to the ſurface. In either of theſe caſes, the compound magnetiſm of the whole may change exceedingly, by a change by no means conſiderable in the magnetiſm of each pair of poles. It is difficult to ſubject this to calculation; but the reader may have very convincing proof of it, by taking a ſtrong and a weaker magnet of the ſame length, and one of them, at leaſt, of ſteel not harder than ſpring temper. Lay them acroſs each other like an acute letter X; and then place a compaſs needle, ſo that its plane of rotation may be perpendicular to the plane of the X. Note exactly the poſition in which the needle ſettles. In a few minutes after, it will be found to change conſiderably, although no remarkable change has yet happened to the magnets themſelves.

74
Speculations about the origin of magnetiſm. Hypotheſis of Æpinus.

We flatter ourſelves, that our readers will grant that the preceding pages contain what may juſtly be called a theory of magnetiſm, in as much as we have been able to include every phenomenon in one general fact, the induction of magnetiſm; and have given ſuch a deſcription of that fact and its modifications, that we can accurately predict what will be the appearances of magnets and iron put into any deſired ſituation with reſpect to each other. If our notions of philoſophical diſquiſition (delivered in article Philosophy, *Encycl.*) be juſt, we have explained the ſubordinate phenomena, or have given a theory of magnetiſm.

But it is not eaſy to ſatisfy human curioſity. Men have even inveſtigated, or ſought for cauſes of the perſeverance of matter in its preſent condition. We have not been contented with Newton's theory of the celeſtial motions, and have ſought for the cauſe of that mutual tendency which he called gravitation, and of which all the motions are particular inſtances.

Philoſophers have been no leſs inquiſitive after what may be the cauſe of that mutual attraction of the diſſimilar poles, and the repulſion of the ſimilar poles, and that faculty of mutual impregnation, or excitement, which ſo remarkably diſtinguiſh iron, in its various ſtates, from all other ſubſtances. The action of bodies on each other at a diſtance, has appeared to them an abſurdity, and all have had recourſe to ſome material intermedium. The phenomenon of the arrangement of iron filings is extremely curious, and naturally engages the attention. It is hardly poſſible to look at it without the thought ariſing in the mind of a ſtream iſſuing from one pole of the magnet, moving round it, entering by the other pole, and again iſſuing from the former outlet. Accordingly, this notion has been entertained from the earlieſt times, and different ſpeculatiſts have had different ways of conceiving how this ſtream operated the effects which we obſerve.

The ſimpleſt and moſt obvious was juſt to make it act like any other ſtream of fluid matter, by impulſion. Impulſion is the thing aimed at by all the ſpeculatiſts. They have a notion, that we conceive this way of communicating motion with intuitive clearneſs, and that a thing is fully explained when it can be ſhewn that it is a caſe of impulſion. We have conſidered the authority of theſe explanations in the article IMPULSION of this *Supplement*, and need not repeat our reaſons for refuſing it any pre-eminence. But even when we have ſhewn the phenomena to be caſes of impulſion by ſuch a ſtream, the greateſt difficulty, the moſt curious and the moſt embarraſſing, is to aſcertain the ſources of this impulſive motion of the fluid—How, and from what cauſe does it begin? What forces bend it in curves round the magnet? Thoſe philoſophers, whoſe principle obliges them to explain gravitation alſo by impulſe, muſt have another ſtream to impel this into its curves. Acting by impulſion, this magnetic ſtream muſt loſe a quantity of motion equal to what it communicates. What is to reſtore this? What directs it in a particular courſe thro' the magnet! And what is it that can totally alter that courſe—in a moment—in all the phenomena of induced magnetiſm? How does it impel? Lucretius, either of himſelf, or ſpeaking after the Greek philoſophers, makes it impel, not the iron, but the ſurrounding air, ſweeping it out of the way; and thus giving occaſion for the ſurrounding air to ruſh around the magnet, and to hurry the bits of iron toward it. There is, perhaps, more ingenious refinement in this thought than in any of the impulſive theories adopted ſince his day by Des Cartes, Euler, and other great philoſophers: But it is ſagaciouſly remarked by D. Gregory, in his MS. notes on Newton, that this theory of Lucretius falls to the ground; becauſe the experiments ſucceed juſt as well under water as in the air As to the explanations, or deſcriptions, of the canals and their dock gates, opening in one direction, and ſhutting in the other, conſtructions that are changed in an inſtant in a bar of iron, by changing the poſition of the magnet, we only wonder that men, who have a reputation to loſe, ſhould ever hazard ſuch crude and unmechanical dreams before the public eye. The mind of man cannot conceive the poſſibility of their formation; and if they are really formed, the effects ſhould be the very oppoſite of thoſe that are obſerved: the ſtream ſhould move thoſe bodies leaſt which afford ready channels for its paſſage. If a rag of iron filings be arranged by the impulſion of ſuch a ſtream, it ſhould be carried along by it; and if it is *impelled toward* one end of the magnet, it ſhould be impelled *from* the other end. Since we now know, that each particle of filings is a momentary magnet, we muſt allow a ſimilar ſtream whirling round each. Is that an explanation which exceeds all power of conception?

But has it ever been ſhewn, that there is any impulſion at all in theſe phenomena? Where is the impelling ſubſtance? The only argument ever offered for its exiſtence is, that we are reſolved that the phenomena of magnetiſm ſhall be produced by impulſion, and the arrangement of iron filings looks ſomewhat like a ſtream. But enough of this. We truſt that we have ſhewn the way in which this arrangement obtains in the cleareſt manner. Every particle becomes magnetic by induction. This is a fact, which ſets all reaſoning at defiance. The polarity of each rag is ſo diſpoſed, that their adjoining ends turn to each other. This is another uncontrovertible fact. And theſe two facts explain the whole. The arrangement of iron filings, therefore, is a ſecondary fact, depending on principles more general; and therefore cannot, conſiſtently with juſt logic, be aſſumed as the foundation of a theory.

Had magnetiſm exhibited no phenomena beſides the attraction and repulſion of magnets, it is likely that we ſhould not have proceeded very far in our theories, and would have contented ourſelves with reducing theſe phenomena to their moſt general laws. But the communication of magnetiſm ſeems a great myſtery. The ſimple approach of a magnet communicates theſe powers to a piece of iron; and this without any diminution of its own powers. On the contrary, beginning with magnets which have hardly any ſenſible power, we can, by a proper alternation of the manipulations, communicate the ſtrongeſt magnetiſm to as many hard ſteel bars as we pleaſe; and the original magnets ſhall be brought to their higheſt degree of magnetiſm. We have no notion of powers or faculties, but as qualities of ſome ſubſtances in which they are inherent. Yet here is no appearance of ſomething abſtracted from one body, and communicated to, or ſhared with another. The proceſs is like kindling a great fire by a ſimple ſpark; here is no communication, but only *occaſion* given to the exertion of powers inherent in the combuſtible matter. It appears probable, that the caſe is the ſame in magnetiſm; and that all that is performed in making a magnet is the excitement of powers already in the ſteel, or the giving occaſion for their exertion; as burning the thread which ties together the two ends of a bow, allows it to unbend. This notion did not eſcape the ſagacity of Dr Gilbert; and he is at much pains to ſhew, that the *coitio magnetica* is a quality inherent in all magnetical bodies, and only requires the proper circumſtance for its exertion. He is not very fortunate in his attempts to explain *how* it is developed by the vicinity of a magnet, and how this faculty, or actual exertion of this power, becomes permanent in one body, while in another it requires the conſtant preſence of the magnet.

74 Magnetical hypotheſis of Æpinus.

It is to Mr Æpinus, of the Imperial Academy of St Peterſburg, that we are indebted for the firſt really philoſophical attempt to explain all theſe myſteries. We mentioned, in the article Electricity, *Suppl.* the circumſtance which ſuggeſted the firſt hint of this theory to Æpinus, *viz.* the reſemblance between the attractions and repulſions of the tourmaline and of a magnet. A material cauſe of the electric phenomena had long been thought familiar to the philoſophers. They had attributed them to a fluid which they called an electric fluid, and which they conceived to be ſhared among bodies in different proportions, and to be transferable from one to another. Dr Franklin's theory of the Leyden phial, which led him to think that the faculty of producing the electrical phenomena depended on the deficiency as well as the redundancy of this fluid, combined with the phenomena of induced electricity, ſuggeſted to Æpinus a very perſpicuous method of ſtating the analogy of the tourmaline and the magnet; which he publiſhed in 1758 in a paper read to the academy.

Reflecting more deeply on theſe things, Mr Æpinus came by degrees to perceive the perfect ſimilarity between all the phenomena of electricity by poſition and thoſe of magnetiſm; and this led him to account for them in the ſame manner. As the phenomena of the Leyden phial, explained in Franklin's manner, ſhews that a body may appear electrical all over, by having leſs than its natural quantity of the electric fluid, as well as by having more, it ſeemed to follow, that it may alſo be ſo in reſpect to different parts of the ſame body; and therefore a body may become electrified in oppoſite ways at its two extremities, merely by abſtracting the fluid from one end, and condenſing it in the other; and thus may be explained the phenomena of induced electricity, where nothing appears to have been communicated from one body to the other. If this be the caſe, the two ends of a body rendered electric by induction ſhould exhibit the ſame diſtinctions of phenomena that are exhibited by bodies wholly redundant and wholly deficient. The redundant ends ſhould repel each other; ſo ſhould the deficient ends; and a redundant part ſhould attract a deficient. All theſe reſults of the conjecture tally exactly with obſervation, and give a high degree of probability to the conjecture. The ſimilarity of theſe phenomena to the attractions of the diſſimilar poles of a magnet, and the repulſions of the ſimilar poles, is ſo ſtriking, that the ſame mode of explanation forces itſelf on the mind, and led Mr Æpinus to think, that the faculty of producing the magnetical phenomena belonged to a magnetical fluid, reſiding in all bodies ſuſceptible of magnetiſm; and that the exertion of this faculty required nothing but the abſtraction of the fluid from one end of the magnetic bar, and its conſtipation in the other. And this conjecture was confirmed by obſerving, that in the induction of magnetiſm on a piece of iron, the power of the magnet is not diminiſhed.

All theſe circumſtances led Mr Æpinus to frame the following hypotheſis;

1. There exiſts a ſubſtance in all magnetic bodies, which may be called the magnetic fluid; the particles of which repel each other with a force decreaſing as the diſtance increaſes.

2. The particles of magnetic fluid attract, and are attracted by the particles of iron, with a force that varies according to the ſame law.

3. The particles of iron repel each other according to the ſame law.

4. The magnetic fluid moves, without any conſiderable obſtruction, through the pores of iron and ſoft ſteel; but is more and more obſtructed in its motion as the ſteel is tempered harder; and in hard tempered ſteel, and in the ores of iron, it is moved with the greateſt difficulty.

In conſequence of this ſuppoſed attraction for iron, the fluid may be contained in it in a certain determinate quantity. This quantity will be ſuch, that the accumulated attraction of a particle for all the iron balances, or is equal to, the repulſion of all the fluid which the iron contains. The quantity of fluid competent to a particle of iron is ſuppoſed to be ſuch, that the repulſion exerted between it and the fluid competent to another particle of iron is alſo equal to its attraction for that particle of iron: And therefore the attraction between the fluid in an iron bar A for the iron of another bar B, is juſt equal to its repulſion for the fluid in B; it is alſo equal to the repulſion of the iron in A for the iron in B. This quantity of fluid reſiding in the iron may be called its NATURAL QUANTITY.

In conſequence of the mobility through the pores of the iron, the magnetic fluid may be abſtracted from one end of a bar, and condenſed in the other, by the agency of a proper external force. But this is a violent ſtate. The mutual repulſion of the particles of condenſed fluid, and the attraction of the iron which it has quitted, tend to produce a more uniform diſtribution. If we reflect on the law of action, we ſhall clearly perceive, that ſomewhat of this tendency muſt obtain in every ſtate of condenſation and rarefaction, and that there can be a perfect equilibrium only when the fluid is diffuſed with perfect uniformity. This, therefore, may be called the NATURAL STATE of the iron.

If the reſiſtance oppoſed by the iron to the motion of the magnetic fluid be like that of perfect fluids to the motion of ſolid bodies, ariſing entirely from the communication of motion, there is no tendency to uniform diffuſion ſo weak as not to overcome ſuch reſiſtance, and finally to produce this uniform diſtribution. But (as is more probable) if the obſtruction reſembles that of a clammy fluid, or of a ſoft plaſtic body like clay, ſome of the accumulation, produced by the agency of an external force, may remain when the force is removed; the diffuſion will ceaſe whenever the equaliſing force is juſt in equilibrio with the obſtruction.

All the preceding circumſtances of the hypotheſis are ſo perfectly analogous to the hypotheſis of Mr Æpinus for explaining the electrical phenomena, which is given in detail in the article Electricity of this *Supplement*, that it would be ſuperfluous to enter into a minute diſcuſſion of their immediate reſults. We therefore beg the reader to peruſe that part of the article Electricity where the elements of Æpinus's hypotheſis are delivered, and the phenomena of induced electricity explained (*viz.* from n° 11. to 60. incluſive), and to ſuppoſe the diſcourſe to relate to the *magnetical* fluid. Let N, S, *n*, *s*, be conſidered as the overcharged and undercharged parts of a magnetical body, or the poles of a magnet, and of iron rendered magnetical by induction. We ſhall confine our obſervations in this place to thoſe circumſtances in which the mechanical phenomena of magnetiſm are limited by the circumſtance, that magnets always contain their natural quantity of fluid; ſo that their action on iron, and on each other, depends entirely on its unequable diſtribution; as is the caſe with induced electricity.

75 Magnetiſm how induced on iron by juxtapoſition.

Let the magnet NAS (fig. 26.), having its north pole NA overcharged, be ſet near to the bar n B s of common iron, and let their axes form one ſtraight line. Then (as in the caſe of electrics) the overcharged pole NA acts on the bar B only by means of the redundant fluid which it contains. For that portion of its fluid, which is juſt ſufficient for ſaturating the iron, will repel the fluid in B, juſt as much as the iron in NA attracts it; and therefore the fluid in B ſuſtains no change from this portion of the fluid in NA. In like manner, the pole SA acts on B only in conſequence of the iron in SA, which is not ſaturated or attended by its equivalent fluid.

If the fluid in B is immoveable, even the redundant fluid in NA, and redundant iron in SA, will produce no *ſenſible* effect on it: For every particle of iron in B is accompanied by as much fluid as will balance, by its repulſions and attractions, the attractions and repulſions of the equidiſtant particle of iron. But as the magnetical fluid in B is ſuppoſed to be eaſily moveable, it will be repelled by the redundant fluid in AN toward the remote extremity n, till the reſiſtance that it meets with, joined to its own tendency to uniform diffuſion, juſt balances the repulſion of AN. This tendency to uniform diffuſion obtains as ſoon as any fluid quits its place; as has been ſufficiently explained in the Supplementary article Electricity, n° 16. 17. &c.

But, at the ſame time, the redundant iron in AS attracts the fluid in B, and would abſtract it from B n, and condenſe it into B s. This attraction oppoſes the repulſion now mentioned. But, becauſe AS is more remote from every point of B than AN is from the ſame point, the repulſions of the redundant fluid in AN will prevail; and, on the whole, fluid will be propelled toward n, and will be rarefied on the part B s. But as to what will be the law of diſtribution, both in the redundant and deficient parts of B, it is plain that nothing can be ſaid with preciſion. This muſt depend on the diſtribution of the fluid in the magnet NAS. The more diffuſed that we ſuppoſe the redundant fluid and matter in the magnet, the farther removed will the centres of effort of its poles be from their extremities; the ſmaller will be the action of AN and AS, the ſmaller will be their difference of action; and therefore the ſmaller will be the condenſation in B n, and the rarefaction in B s. Hence we learn, in the outſet of this attempt to explanation, that the action of a magnet will be ſo much the greater as its poles are more concentrated. This is agreeable to obſervation, and gives ſome credit to the hypotheſis. We can juſt ſee, in a very general manner, that the fluid will be rarer than its natural ſtate in s, and denſer in n; and that the change of denſity is gradual, and that the denſity may be repreſented by the ordinates of ſome line $c\,b\,d$ (fig. 27), while the natural denſity is repreſented by the ordinates to the line C b D, parallel to $s\,n$. There will be ſome point B of the iron bar, where the fluid will be of its natural denſity, and the ordinate B b will meet the line $c\,b\,d$ in the point of its interſection with CD.

All this action is internal and imperceptible. Let us inquire what will be the *ſenſible* external action. There is a ſuperiority of attraction towards the magnet: For ſince the magnetic action is ſuppoſed to diminiſh continually by an increaſe of diſtance, the curve, whoſe ordinates repreſent the forces, has its convexity toward the axis. Alſo, the force of the poles AN, AS are equal at equal diſtances: For, by the hypotheſis, the attraction and repulſion of an individual particle are equal at equal diſtances; and the condenſation in AN is equal to the deficiency in AS, by the ſame hypotheſis; becauſe NAS ſtill contains its natural quantity of fluid. Therefore the action of both poles may be expreſſed by the ordinates of the ſame curve, and they will differ only by reaſon of their diſtances. We may therefore expreſs the actions by the four ordinates Mm, Pp, Nn, Qq, of fig. 2.; of which the property (deduced from the ſingle circumſtance of its being convex toward the axis) is, that $Mm + Qq$ is greater than $Pp + Nn$. There is therefore a ſurplus of attraction. It is only this ſurplus that is perceived. The fluid, moveable in B, but retained by it ſo as not to be allowed to eſcape, is preſſed towards its remote end n by the exceſs $Pp - Qq$ of the repulſion of the redundant fluid in AN, above the attraction of the redundant iron in AS. This exceſs on every particle of the fluid is tranſmitted, by the common laws of hydroſtatics, to the ſtratum immediately incumbent on the extremity n, and B is thus preſſed away from A. But every particle of the ſolid matter in B is attracted towards A by the exceſs $Mm - Nn$ of the attraction of the redundant fluid in AN above the repulſion of the redundant iron in AS: and this exceſs is greater that the other; for $m + q$ is greater than $p + n$.

The piece of common iron n B s is therefore attracted, *in conſequence* of the fluid in it having been propelled towards its remote extremity, and diſtributed in a manner ſomewhat reſembling its diſtribution in NAS. Now, in this hypotheſis, magnetiſm is held to depend entirely on the diſtribution of the fluid. B has therefore become a magnet, has magnetiſm induced on it, and, only in conſequence of this induction, is attracted by A.

Had we ſuppoſed the deficient, or ſouth pole of A, to have been neareſt to B, the redundant matter in AN would have attracted the moveable fluid in B more than the remoter redundant fluid in AS repels it; and, on this account, the magnetic fluid would have been conſtipated in B s, and rarefied in B n. It would, in this caſe alſo, have been diſtributed in a manner ſimilar to its ſituation in the magnet. And B would therefore have been a momentary magnet, having its redundant pole fronting the deficient or diſſimilar pole of A. It is plain, that there would be the ſame ſurplus of attraction in this as in the former inſtance, and B would (on the whole) be attracted in conſequence, and only in conſequence, of having had a properly diſpoſed magnetiſm induced on it by juxtapoſition. The ſenſible attraction, in this caſe, is a *conſequence* of the diſtribution now deſcribed; becauſe, ſince the fluid conſtipated in the end next to A cannot quit B, the tendency of this fluid toward A muſt preſs the ſolid matter of B in this direction (by hydroſtatical laws) more than this ſolid matter is repelled in the oppoſite direction.

Thus it appears, that the hypotheſis tallies preciſely with the induction of magnetiſm. We do not call this an explanation of the phenomenon; for the fact is, that it is the hypotheſis that is explained by the phenomenon: That is, if any perſon be told that induced magnetiſm is produced by the action of a fluid, in conſequence of its ſituation being changed, he will find, that in order to agree with the attraction of diſſimilar, and the repulſion of ſimilar poles, he muſt accommodate the fluid to the phenomena, by giving it the properties aſſigned to it by Æpinus.

76 Conformity of the hypotheſis with a vaſt variety of phenomena.

But the agreement with this ſimpleſt poſſible caſe of the moſt ſimple example of induced magnetiſm, is not enough to make us adopt the hypotheſis as adequate to the explanation of all the magnetic phenomena. We muſt confront the hypotheſis with a variety of obſervations, to ſee whether the coincidence will be without exception.

When the key CB, in fig. 8. is brought below the conſtipated north pole N of the magnet SAN, its own moveable fluid is propelled from C towards B, and is diſpoſed in CB nearly after the ſame manner as in SAN. Therefore the redundant fluid in the lower end of the key repels the moveable fluid in the wire BD more than the redundant matter in the upper end C attracts it; and thus the fluid is rarefied in the upper end of the wire BD, and condenſed in its lower end D. CB and BD therefore are two temporary magnets, having their diſſimilar poles in contact, or neareſt to each other. This is all that is required for their attraction. This effect is promoted by the action of N on the wire BD, alſo propelling the fluid toward D; and thus increaſing the mutual attraction of CB and BD. In like manner, when the key CB is held above the magnet, the moveable fluid in it is more attracted by the redundant matter in SA than it is repelled by the more remote redundant fluid in AN. The ſame thing happens to the fluid in the wire BD. Therefore CB and BD muſt attract each other; and the key will carry the wire, although the magnet is below it, and alſo attracts it. This ſingularity proceeds from the almoſt perfect mobility of the fluid in the two pieces of common iron, which renders their poles extremely conſtipated; whereas the hardneſs required for the fixed magnetiſm of the magnet prevents this complete conſtipation and rarefaction. This can be ſtrictly demonſtrated in the caſe of ſlender rods of iron; but we can ſhew, and experience confirms it, that in other caſes, depending on the ſhape and the temper of the pieces, the wire will not adhere to the key, but to the magnet.

In the various ſituations and poſitions of the key and wire repreſented in fig. 7. the actions of ſome of the poles on the moveable fluid in the iron are oblique in regard to the length of the pieces; but, ſince the moveable matter is ſuppoſed to be a fluid, it will ſtill be propelled along the pieces, notwithſtanding their obliquity, in the ſame manner as gravity makes water occupy the lower end of a pipe lying obliquely. If indeed the magnetic fluid could eſcape from the iron without any obſtruction by the propulſion of the magnet, it could produce no attraction, or ſenſible motion, any more than light does in a tranſparent body. What is demonſtrated of the electric fluid in the Supplemental article Electricity, n° 133. is equally true here. Why the fluid does not eſcape when it is ſo perfectly moveable, is a queſtion of another kind, and will be conſidered afterwards; at preſent, the *hypotheſis* is, that it does not eſcape.

If the key and wire have the poſition fig. 10. n° 1. the fluid is expelled from the parts in contact, and is condenſed in the remote ends. So far from attracting each other, the key and wire muſt repel. They are temporary magnets, having their ſimilar poles fronting each other. They muſt repel each other, if preſented in a ſimilar manner to the ſouth pole of the magnet.

If they be preſented as in n° 2. fig. 10. where the actions of both poles of the magnet are equal, the ſtate of the fluid in them will not be affected. The redundant pole of the magnet repels the moveable fluid in both the key and the wire toward the upper ends; but the deficient pole acts equally on it in the oppoſite direction. It therefore remains uniformly diſtributed through their ſubſtance; and therefore they can exhibit no appearance of magnetiſm.

But if the key and wire be preſented to the *ſame* part of the magnet, but in another poſition, as ſhewn in fig. 8. n° 3. the fluid of the key will be abſtracted from C, and condenſed in B, by the joint action of both poles of the magnet. The ſame thing will happen in the wire BD. Here, therefore, we have two magnets, with their diſſimilar poles touching. They will attract each other ſtrongly; and if carried gradually toward the upper or lower end of the magnet, they will ſeparate before the point B arrives abreaſt of N or S. For ſimilar reaſons, the pieces of iron preſented to the middle of the magnet, as in fig. 10. will have one ſide a weak north pole, and the other ſide a weak ſouth pole; but this will not be conſpicuous, unleſs the pieces be broad.

This experiment ſhews, in a very perſpicuous manner, the competency of the hypotheſis to the explanation of the phenomena. When the fluid is not moved, magnetiſm is not induced, even on the moſt ſuſceptible ſubſtance.

When a piece of iron A (fig. 10.), nearly as large as the magnet can carry, hangs at either pole, a large piece of iron B, brought near to the pole on the other ſide, ſhould cauſe it immediately to fall. If S be the deficient pole, it cauſes the fluid in A to aſcend to the top, and A is attracted: but, for the ſame reaſon, it cauſes the fluid in B to accumulate in its lower end. This redundant fluid muſt evidently counteract the redundant matter in S, in the induction of the magnetic ſtate on A. Being more remote from A than S is, it cannot wholly prevent the accumulation in the upper end on A; but it renders it ſo trifling, that the remaining attraction thence ariſing cannot ſupport the weight of A. This is a very inſtructive experiment.

But if, on the contrary, we bring a large piece of iron C below the heavy key A, this piece C will have its fluid accumulated in its upper end, both by the action of A on it, and by the action of the magnet. The attraction of the magnet for A ſhould therefore be augmented; and a magnet ſhould carry a heavier lump of iron when a great lump is beyond it. And it is clear (we think), for ſimilar reaſons, that the magnetiſm of the magnet itſelf in fig. 11. ſhould be increaſed by bringing a great lump of iron near its oppoſite pole: for the magnet differs from common iron only in the *degree* of the mobility of its fluid.

When a compaſs needle is placed oppoſite to the redundant pole N of a magnet AN (fig. 28.), it arranges itſelf magnetically. If a piece of common iron be now preſented laterally to the near point of the needle, the redundant matter in the adjoining parts of the needle and the iron ſhould make them repel; but if preſented to the remote end, the redundant matter in the iron ſhould attract the redundant fluid in that end of the needle, and that end ſhould turn toward the iron.

A parcel of ſlender iron wires, carried by the pole of a magnet, as in fig. 29. ſhould avoid each other. If N be the redundant pole, the fluid in each wire will be driven to the remote end, where it muſt repel the ſimilarly ſituated fluid of its neighbour. The ſame external appearance muſt be exhibited by pieces of wire hanging at the deficient pole of the magnet.

The redundant pole of a magnet A (fig. 30.) being held vertically above the centre of two pieces of common iron, moveable round a ſlender pin, renders the middle of each deficient, and their extremities redundant; therefore they ſhould repel each other, and ſpread out. The ſame effect ſhould be produced by the under charged pole of A.

The redundant pole of a magnet A being applied to one branch of the piece of forked iron NCS (fig. 31.), ſhould drive the fluid into its remote parts C, and then the branch NC ſhould be able to induce the magnetic ſtate on a bit of iron D. But if the deficient pole S of another magnet B be applied to the other branch, theſe two actions ſhould counteract each other at C, and the iron ſhould remain indifferent, and fall.—Yet the magnet B alone would equally cauſe C to carry the piece of iron.

It is ſurely unneceſſary to demonſtrate, that the conſequence of this hypotheſis muſt be, that when a magnet puts any piece of iron into the magnetic ſtate, its own magnetiſm is improved. For the induced magnetiſm of the iron is always ſo diſpoſed as to give the fluid in the magnet a greater conſtipation where already condenſed, and to abſtract more fluid from the parts already deficient. If magnetiſm be produced by ſuch a fluid, a magnet muſt always improve by lying any how among pieces of iron.

But the caſe may be very different when magnets are kept in each others neighbourhood. When the overcharged poles of two magnets are placed fronting each other, the redundant fluid in each repels that in the other more than it attracts the remoter redundant iron. The magnets muſt therefore repel each other. Moreover, in rendering them magnetical, the repulſion of redundant fluid, or the attraction of redundant matter of ſome other magnet, had been employed; and when the magnet was removed, ſome of the conſtipated fluid overcame the obſtruction to its uniform diffuſion, and eſcaped into the deficient pole; what remains is withheld by the obſtruction, and the reſtoring forces are juſt in equilibrio with this obſtruction. If we now add to them the repulſion of redundant fluid, directed toward the deficient pole, ſome more of the conſtipated fluid muſt be driven that way, and the magnet muſt be weakened. Nay, it may be deſtroyed, and even reverſed, if one of the magnets be very powerful, and have its own magnetiſm very fixed; that is, if its fluid be very redundant, and meet with very great obſtruction to its motion. Hence it alſo ſhould follow, that the repulſion obſerved between two magnets ſhould be weaker at the ſame diſtance than their attraction, and ſhould follow a different law. For, in the courſe of the experiments, the ſituation of the fluid in the magnets is continually changing, and approaching to a ſtate of uniform diffuſion.

77
Explanation of the directive power, and of polarity.

Let us now examine into the ſenſible effect of this fluid on a magnet which cannot move from its place, but can turn on its centre like a compaſs needle. This ſcarcely requires any diſcuſſion. We ſhould only be repeating, with regard to the redundant fluid and redundant matter, what we formerly ſaid in regard of north pole and ſouth pole; the little magnet muſt arrange itſelf nearly in the tangent of a magnetic curve. But it requires a more minute inveſtigation to determine what the ſenſible phenomenon ſhould be when the fluid of the little magnet is perfectly moveable.

Suppoſe therefore a particle C (fig. 32.) of magnetic fluid, at perfect liberty to move in every direction, and acted on by the redundant and deficient poles of a magnet NAS. The redundant iron in S attracts C in the direction and with the force CF, while the redundant fluid in N repels it in the direction and with the force CD. By their joint action it muſt be urged in the direction and with the force CE, the diagonal of the parallelogram CDEF, which muſt be accurately a tangent to a magnetic curve. If this particle of fluid belong to the piece of iron *n* C *s*, which lies in that very direction, it will unqueſtionably be puſhed towards the extremity *n*. The ſame muſt happen to other particles. Hence it appears that a piece of common iron in this ſituation and poſition muſt become a magnet, and muſt retain this poſition; only the mechanical energy of the lever may change the equilibrium of the magnetic forces a little; becauſe when the piece of iron *n* C *s* has any ſenſible magnitude, the action on its different points will be a little unequal, and may compoſe diagonals which divide a little from the tangent.

Should the iron needle chance not to have the exact poſition, but not deviate very far from it, it is alſo clear that the fluid, not being able to eſcape, will preſs on the ſide toward which it is impelled; and thus will cauſe the needle to turn on its pivot, and finally arrange itſelf in magnetical and mechanical equilibrium, deviating ſo much the leſs from a tangent to a magnetic curve as the piece of iron is ſmaller. Any piece of common iron, held in the neighbourhood of a magnet, will become more overcharged at one end and undercharged at the other, in proportion as the poſition of its length comes nearer to the tangent of a magnetic curve. A ſlender wire held perpendicular to this poſition, that is, perpendicular to the curve, ſhould not acquire any ſenſible magnetiſm, either attractive or directive.

78
Explanation of the curves formed by iron filings.

We ſurely need not now employ many words to ſhew that a parcel of iron filings, ſtrewed round a magnet, ſhould arrange themſelves in the primary magnetic curves, or that when ſtrewed round two magnets they ſhould form the ſecondary or compoſite curves.

79
Explanation of tranſitory and of permanent magnetiſm, and of indifferent and determinate magnetiſm.

Let us now enquire more particularly into the modifications of this accumulation of magnetic fluid which may reſult from the nature of the piece of iron, as it is put into the magnetic ſtate. The propelling force of A acts againſt the mutual repulſion of the particles of fluid in B, and alſo againſt the obſtruction to its motion through the pores of B. The greater this obſtruction, the ſmaller will be the accumulation which ſuffices, in conjunction with the obſtruction and the attraction of the deſerted iron, to balance the propulſive force of the redundant fluid in the overcharged pole of A. This circumſtance therefore muſt limit the accumulation that can be produced in a given time. Therefore the magnetiſm produced on ſoft ſteel or iron ſhould be greater than that produced in hard ſteel at the ſame diſtance. Hence the great advantage of ſoft poles, or of armour, or of capping, to a loadſtone, or to a bundle of hard bars. The beſt form and dimenſions of this armour is certainly determinable by mathematical principles, if we knew the law of magnetical action, and the diſpoſition of the magnetiſm in our loadſtone; but theſe are too imperfectly known in all caſes for us to pretend to give any exact rules. We muſt decide experimentally by making the caps large at firſt, and reducing them till we find the loadſtone carry leſs; then make them a ſmall matter larger. The chief things to be minded are the purity, the uniformity, and the ſoftneſs of the iron, and the cloſeſt poſſible contact.

If the obſtruction reſemble that to motion through a clammy fluid, the final accumulation in hard ſteel may be nearly equal to that in iron, but will require much longer time. Alſo, becauſe ſuch obſtruction to the motion of the fluid will nearly balance the propelling force in parts that are far removed from the magnet, the accumulation will begin thereabouts, while the bar beyond is not yet affected. A redundant pole will be formed in that place. This will operate on what is *immediately* beyond it, driving the fluid farther on, and occaſioning another accumulation at a ſmall diſtance. This may produce a ſimilar effect in a ſtill ſmaller degree farther on. Thus the ſteel bar will have the fluid alternately condenſed and rarefied, and contain alternate north and ſouth poles. This ſtate of diſtribution will not be permanent; fluid will be gradually changing its place; theſe poles will gradually advance along the bar, the remoter poles becoming gradually more diffuſe and faint; and it will not be till after a very long time that a regular magnetiſm with two poles will be produced. To ſtate mathematically the procedure of this mechaniſm would require many pages. Yet it may be done in ſome ſimple caſes, as Newton has ſtated the proceſs of aerial undulation. But we cannot enter upon the taſk in this limited diſſertation. What is ſaid in the Supplementary article Electricity (n° 217, 218.) on the diſtribution of the electric fluid in an imperfect inſulator, will aſſiſt the reader to form a notion of the ſtate of magnetiſm during its induction. That ſuch alternations proceed from ſuch mechaniſm, we have ſufficient proof in the inſtances mentioned in the former part of this article. The wave, or curl, produced on the ſurface of a clammy fluid, is a phenomenon of the ſame kind, and owing to ſimilar cauſes.

When the magnet which has produced all theſe changes is removed, it is evident that a part of this accumulation will be undone again. The repulſion of the condenſed fluid, and the attraction of the deſerted iron, will bring back ſome of the fluid. But it is very evident, that a part of the accumulation will remain, by reaſon of the obſtruction to its motion in returning: and this remainder muſt be ſo much the greater as the obſtruction to the change of ſituation is greater. In ſhort, we cannot doubt but that the magnetiſm which remains will be greater in hard than in ſpring tempered ſteel.

80 Rationale of the proceſs for making magnets.

Thus have we traced the hypotheſis in a great variety of circumſtances and ſituations, and pointed out what ſhould be the external appearance in each. We did not, in each inſtance, mention the perfect coincidence of theſe conſequences with what is really obſerved, but left it to the recollection of the reader. The coincidence is indeed ſo complete, that it ſeems hardly poſſible to refuſe granting that nature operates in this or ſome very ſimilar manner. We get ſome confidence in the conjecture, and may even proceed to explain complicated phenomena by this hypothetical theory. We might proceed to ſhew, that the effects of all the methods practiſed by the artiſts in making artificial magnets are eaſy conſequences of the hypotheſis; but this is hardly neceſſary. We ſhall juſt mention ſome facts in thoſe proceſſes which have puzzled the naturaliſts.

1. A ſtrong magnet is known to communicate the greateſt magnetiſm to a bar of hard ſteel; but Muſchenbroek frequently found, that a weak magnet would communicate more to a ſoft than to a hard bar.

Explanation. When the magnet is ſtrong enough to impregnate both as highly as they are capable of, the hard bar muſt be the ſtrongeſt; but if it can ſaturate neither, the ſpring-tempered bar muſt be left the moſt magnetical.

2. A ſtrong magnet has ſometimes communicated no higher magnetiſm than a weaker one; both have been able to ſaturate the bar.

3. A weak magnet has often impaired a ſtrong one by ſimply paſſing along it two or three times; but a piece of iron always improves a magnet by the ſame treatment.

Explanation. When the north pole of a weak but hard magnet is ſet on the north pole of a ſtrong one, it muſt certainly repel part of the fluid towards the other end, and thus it muſt weaken the magnet. When it is carried forward, it cannot repel this back again, becauſe it is not of itſelf ſuppoſed capable of making the magnet ſo ſtrong. But the end of a piece of iron, always acquiring a magnetiſm oppoſite to that of the part which it touches, muſt increaſe the accumulation of fluid where it is already condenſed, and muſt expel more from thoſe parts which are already deficient.

4. All the parts of the proceſs of the double touch, as practiſed by Meſſrs Mitchell and Canton, are eaſily explained by this hypotheſis. A particle of fluid *p* (fig. 33.), ſituated in the middle between the two magnets, is repelled in the direction *p e* by the redundant pole of the magnet AN, whoſe centre of effort is ſuppoſed to be at C. It is attracted with an equal force in the direction *p d* toward the centre of effort of the deficient pole of AS. By theſe combined actions it is impelled in the direction *pf*. Now it is plain that, although by increaſing the diſtance between N and S, the forces with which theſe poles act on *p* are diminiſhed, yet the compound force *pf* may increaſe by the diminution of the angle *d p e*. If the action is as $\frac{1}{x^2}$, *pf* will be greateſt when $\frac{\text{Coſ.}\, d\,p\,f}{d\,p^2}$ is a maximum, or (nearly) when Sin.^{2} *dpf* × Coſ. *dpf* is a maximum: but this depends

on the place of the centre of effort. We can, however, gather from this obſervation, that the nearer we ſuppoſe the centres of effort of the poles N and S to the extremities of the magnets, the nearer muſt they be placed to each other. But we muſt alſo attend to another circumſtance; that by bringing the poles nearer together, although we produce a greater action on the intervening fluid, this action is exerted on a ſmaller quantity of it, and therefore a leſs effect may be produced. This makes a wider poſition preferable; but we have too imperfect a knowledge of the circumſtances to be able to determine this with accuracy. The unfavourable action on the fluid beyond the magnets muſt alſo be conſidered. Yet all this may be aſcertained with preciſion in ſome very ſimple inſtances, and the determination might be of ſervice, if we had not a better method, independent of all hypotheſes or theory; namely, to place the magnets at the diſtance where they are *obſerved* to lift the heavieſt bar of iron; then we are certain that their action is moſt favourable, all circumſtances being combined.

We alſo ſee a ſufficient reaſon for preferring the poſition of the magnets employed by Mr Antheaume (and before him by Mr Servington Savery), in his proceſs for making artificial magnets. The form of the parallelogram *d p e f* is then much more favourable, the diagonal *p f* being much longer.

We alſo ſee, in general, that, by the method of double touch, a much greater accumulation of fluid may be produced than by any other known proceſs.

And, laſtly, ſince no appearances indicate any difference between natural and artificial magnetiſm, this hypotheſis is equally applicable to the explanation of the phenomena of natural magnetiſm; ſuch as the poſition of the horizontal, and of the dipping needle, and the impregnation of natural loadſtones.

Having ſuch a body of evidence for the aptitude of this hypotheſis for the explanation of phenomena, it will ſurely be agreeable to meet with any circumſtances which render the hypotheſis itſelf more probable. Theſe are not wanting; although it muſt be acknowledged that nothing has yet appeared, beſides the phenomena of magnetiſm, to give us any indication of the exiſtence of ſuch a fluid; but there are many particulars in their appearance which greatly reſemble the mechanical properties of a fluid.

81
Probability of the exiſtence of a magnetical fluid.

Heating a rod of iron, and allowing it to cool in a poſition perpendicular to the magnetic direction, deſtroys its magnetiſm. Iron is expanded by heat. If the particles of the magnetic fluid are retained between thoſe of the iron, notwithſtanding the forces which tend to diffuſe them uniformly, they may thus eſcape from between the ferrugineous particles which withheld them. For ſimilar reaſons, magnetiſm ſhould be acquired by heating a bar and letting it cool in the magnetic direction. But, beſides this evident mechanical *opportunity* of motion, the union of fire (or whatever name the neologiſts may chooſe to give to the cauſe of expanſion and of heat) with the particles of iron may totally change the action of thoſe particles on the particles of fluid in immediate contact with them; nay, it may even change the ſenſible law of action between magnet and magnet. Of this no one can doubt who underſtands the application of mathematical ſcience to corpuſcular attraction (See Boscovich, *Suppl.*) A change may be produced in the action between magnets without any remarkable change happening in the actions within the magnet, and it may be juſt the reverſe. The union of fire with the magnetic fluid may increaſe the mutual repulſion of its parts, as it does in all aerial fluids or gaſes. This alone would produce a diſſipation of ſome magnetiſm. It may increaſe the attraction (at inſenſible diſtances) between the fluid and the iron, as it does in numberleſs caſes in chemiſtry.

82
Farther grounds of belief.

It is well known that violently knocking or hammering a magnet weakens its force, and that hammering a piece of iron in the magnetic direction will give it ſome magnetiſm. By this treatment the parts of the iron are put into a tremulous motion, alternately approaching and receding from each other. In the inſtants of their receſs, the pent-up particles of the fluid may make their eſcape. A quantity of ſmall ſhot may be uniformly mixed with a quantity of wheat, and will remain ſo for ever, if nothing diſturb the veſſel; but continue to tap it ſmartly with a ſtick for a long time, and the grains of ſmall ſhot will eſcape from their confinements, and will all go to the bottom. We may conceive the particles of magnetic fluid to be affected in the ſame way. The ſame effect is produced by grinding or filing magnets and loadſtones. The latter are frequently made worthleſs by grinding them into the proper ſhape. This ſhould be avoided as much as poſſible, and it ſhould always be done in moulds made of ſoft iron and very maſſive; but this will not always prevent the diſſipation of *ſtrong* magnetiſm. As a farther reaſon for aſſigning this cauſe for the diſſipation in ſuch caſes, it muſt be obſerved (Muſchenbroek takes notice of it), that a magnet or loadſtone may be ground at its neutral point without much damage. But we had the following moſt diſtinct example of the proceſs. A very fine artificial magnet was ſuſpended by a thread, with its ſouth pole down. A perſon was employed to knock it inceſſantly with a piece of pebble, in ſuch a manner as to make it ring very clearly, being extremely hard and elaſtic. Its magnetiſm was examined from time to time with a very ſmall compaſs needle. In three quarters of an hour, its magnetiſm was not only deſtroyed, but the lower end ſhewed ſigns of a north pole. The ſame magnet was again touched, and made as ſtrong as before, and was then wound about very tight with wetted whipcord, leaving a ſmall part bare in the middle. It was again knocked with the pebble, but could no longer ring. At the end of three quarters of an hour its magnetiſm was ſtill vigorous, and was not near gone after two hours and a quarter. We diſcharged a Leyden jar (coated with gold leaf) in the ſame way. It ſtood on the top of an axis; and while this was turned round, the edge was rubbed with a very dry cork filled with roſin, and faſtened to the end of a glaſs rod. This made the jar ſound like the glaſs of a harmonica. One of them was ſplit in this operation.

A ſmall bar of ſteel was heated red hot and tempered hard between two ſtrong magnets lying in ſhallow boxes filled with water, and was more ſtrongly impregnated in this way than in any other that we could think of for a bar of that ſhape. It has not yet been aſcertained in what temperature it is moſt ſuſceptible of magnetiſm, but it was conſiderably hotter than to be juſt viſible in a dark place. It is no objection to our way of conceiving magnetiſm, that the fluid is immoveable or inactive when the iron is red hot. Either of theſe, or both of them, may reſult from the union with the cauſe of heat. Even a particular degree of expanſion may ſo change the law of action as to make it *immoveable;* or the union with caloric may render it *inactive* at all ſenſible diſtances. We cannot but think, that ſome very inſtructive facts might be obtained by experiments made on iron in the moment of its production, and changes in various chemical proceſſes. All magnetiſm is gone when it is united with ſulphur and arſenic in the greateſt number of ores; and when it is in the ſtate of an ochre, ruſt, æthiops, or ſolution in acids; and when united with aſtringent ſubſtances, ſuch as galls. When, and in what ſtate, does it become magnetic? And whence comes the fluid of Æpinus? It were worth while to try, whether magnets have any influence in the formation or cryſtallization of the martial ſalts; and what will be their effect on iron when precipitated from its ſolutions by another metal, &c. &c.

83
Why magnets have always more than pole.

There remains one remarkable fact to be taken notice of, which, in one point of view, is a confirmation of the hypotheſis, but in another preſents conſiderable difficulties. It is well known, that no magnet has ever been ſeen which has but one pole; that is, on the hypotheſis of Æpinus, which is wholly redundant, or wholly deficient. If all magnetiſm be either the immediate or the remote effect of the great magnet contained in the earth, and if it be produced by induction, without any communication of ſubſtance, but only by changing the diſpoſition of the fluid already in the iron, we never ſhould ſee a magnet with only one pole. It muſt be owned, that we never can make ſuch a magnet by any of the proceſſes hitherto deſcribed; but the exiſtence of ſuch does not ſeem impoſſible. Suppoſing a magnet of the moſt regular magnetiſm, having only two poles; and that we cut it through at the neutral point, or that we cut or break off any part of it—the fact is, (for the experiment has been tried ever ſince men began to ſpeculate about magnetiſm), that each part becomes an ordinary magnet, with two poles, one of which is of the ſame kind as before the ſeparation. The queſtion now is, What ſhould happen according to the theory maintained by Æpinus?—*Tentam. Theor. Elect. et Magnetiſmi*, p. 104, &c.

Let NAS (fig. 34.) be a magnet, of which N is the overcharged pole. Let the ordinates of the curve DAE expreſs the difference between the natural denſity of the fluid, in a ſtate of uniform diffuſion, and its denſity as it is really diſpoſed in the magnet. The area p n ND will there expreſs the quantity of redundant fluid in the part n N, and the area q ES m expreſſes the fluid wanting in the part S m. The interſection A marks that part of the magnet where the fluid is of its natural denſity. Suppoſe the part N n to be ſeparated from the reſt, containing the redundant fluid ND p n. The tendency of this fluid to eſcape from the iron with which it is connected will be greater (Mr Æpinus thinks) than before; becauſe its tendency to quit the magnet formerly was repreſſed by the attractions of the redundant matter contained in AS. This is certainly true of the extremity N; nay, perhaps of all the old external ſurface. Fluid will therefore eſcape. Suppoſe that ſo much has quitted the iron that the point n has the fluid of its natural denſity, as is repreſented in n° 3. there is ſtill a force operating at n, tending to eſcape, ariſing from the repulſion of all the redundant fluid n DN. If this be ſufficient for overcoming the obſtruction, it will really eſcape, and the iron will be left in the ſtate repreſented by n° 4. with an overcharged part f N, and an undercharged part f n.

In like manner, the tendency of the magnetic fluid ſurrounding the magnet to enter into its deficient pole, will be greater when it is ſeparated from the other, not being checked by the repulſion of the redundant fluid in that other.

Mr Æpinus relates ſome experiments which he made on this ſubject. The general reſult of them was, that the moment the parts were ſeparated, each had two poles, and that the neutral point of each magnet was much nearer to the place of their former union than to their other ends. In a quarter of an hour afterward, the neutral points had advanced nearer to their middle, and continued to do ſo, by very ſmall ſteps, for ſome hours, and ſometimes days, and finally were ſtationary in their middles.

84
Defects of this reaſoning.

We acknowledge, that this reaſoning does not altogether ſatisfy us, and that the gradual progreſs of the neutral point toward the middle of each piece, although agreeable to what ſhould reſult from an eſcape of fluid, is not a proof of it. We know already, that the induction of magnetiſm is a progreſſive thing; and we ſhould have expected this change of the ſituation of the neutral point, whatever be the nature of magnetiſm. There is ſomething ſimilar to this, and perhaps equally puzzling, in the immediate recovery of magnetiſm which has been weakened by heat; it is partly recovered on cooling.

But our chief difficulty is this: At the point A (fig. 34.) every thing is in equilibrium before the fracture. The particle A is repelled by the redundant fluid in AN, and attracted by the redundant matter in AS, yet it does not move, for the magnetiſm is ſuppoſed to have permanency. Therefore the obſtruction at A cannot be overcome by the united repulſion of AN and attraction of AS. Nor can the obſtruction at N be overcome by the difference of theſe two forces. Now ſuppoſe AS annihilated. The change made on the ſtate of things at A is ſurely greater than that at N, becauſe the force abſtracted is greater, the diſtance being leſs. It does not clearly appear, therefore, that the removal of AS ſhould occaſion an efflux at N. This, however is not impoſſible; becauſe the fluid may be ſo diſpoſed, by great conſtipation near N, and no great exceſs of denſity near A, that a ſmaller change at N may produce an efflux there. But ſurely the tendency to eſcape at A muſt now be diminiſhed, inſtead of being greater after the fracture. And if any eſcape from N, this will ſtill more diminiſh that tendency to eſcape from A. It does not therefore appear a clear conſequence of the general theory, that the conſtipated fluid ſhould eſcape; and more particularly, that A ſhould become deficient. And with reſpect to the entry of fluid into the other fragment, and its becoming overcharged at m, the reaſoning ſeems ſtill leſs convincing. The ſteps of the phyſical proceſs in the two parts of the original magnet are by no means convertible or counterparts of each other. There is nothing in the part AS to reſemble the force of repulſion really exerting itſelf in the correſponding point of AN. There would be, if there were a particle of fluid in that place;

but there is not. The tendency therefore of external fluid to enter there, does not reſemble the tendency of the internal fluid to expand and diſſipate. It is true, indeed, the diſcourſe ſhould be confined to points of the ſurface. But the internal motion muſt alſo be conſidered ; and the great objection always remains, namely, that the obſtruction at A (n° 1.) or at *n* (n° 3.) is ſufficient to prevent the paſſage of a particle of fluid from the pole AN into the pole AS, when urged by the repulſion of the fluid in the one and the attraction of the iron in the other ; and yet will not prevent the eſcape of a particle when one of thoſe cauſes of motion is removed. Add to this, that the whole hypotheſis aſſumes as a principle, that the reſiſtance to eſcape from any point is greater than the obſtruction to motion through the pores. This is readily granted ; for however great we ſuppoſe the attraction, in the limits of phyſical contact, it will be no obſtruction to motion through the pores, becauſe the particle is equally affected by the oppoſite ſides of the pores ; whereas, in quitting the body altogether, there is nothing beyond the body to counteract the attraction by which it is retained.

There ſeems ſomething wanting to accommodate this beautiful hypotheſis of Mr Æpinus to this remarkable phenomenon ; and the coincidence is otherwiſe ſo complete, that we are almoſt obliged to conclude that it is merely a deficiency, ariſing from our not having a ſufficient knowledge of the law of magnetic action. This is quite ſufficient : For it may be ſtrictly demonſtrated, that if the magnetic action decreaſes in higher ratio than that of the ſquares of the diſtances, the permanency of the fluid in any particular diſpoſition has ſcarcely any dependence on the particles at any ſenſible diſtance, and is affected only by the *variations* of its denſity (See Electricity, *Suppl.* n° 217. for a caſe ſomewhat ſimilar). Therefore, if the fluid be ſo diſpoſed, that its denſity may be repreſented by the ordinates of ſuch a curve as is drawn in fig. 34. having its two extremities concave toward the axis, and a point of contrary flexure at A, the tendency to eſcape at A will be the greateſt poſſible ; and when the magnet is broken at A (n° 1.), or when the fluid has taken the arrangement repreſented by n° 3. it *cannot* ſtop there, and *muſt* become deficient in that part. Now, it muſt be acknowledged, that we are not abſolutely certain that the magnetic action is in the preciſe inverſe duplicate ratio of the diſtance. All that we are certain of is, that it is much nearer to it than to either the inverſe ſimple or inverſe triplicate ratio. We own ourſelves rather diſpoſed to aſcribe the preſent difficulty to our ignorance of ſome circumſtance, purely mathematical, overlooked, or miſtaken, than to think a conjecture unfounded, which tallies ſo accurately with ſuch a variety of phenomena.

We may here obſerve, that we are not altogether ſatisfied with Æpinus's form of the experiment. He did not break a magnet ; he ſet two ſteel bars end to end, and touched them as one bar, making the magnetiſm perfectly regular ; he then ſeparated them, and found that each had two poles. But was he certain that, when joined, they made but one magnet ? We have ſometimes ſucceeded in doing this, as we thought, by the curves of iron filings ; but on putting the needle with which we were examining their polarity into proper ſituations, we ſometimes found it in the ſecond interſection of the ſecondary curves, ſhewing that the bars were really two magnets, and not one.

On the other hand, when a piece is broken off from a magnet, the ſucceſſion and elaſtic tremor into which the parts are thrown, and even the bending previous to the fracture, may give opportunity to a diſſipation, which could not otherwiſe happen. The parts ſhould be ſeparated by corroſion in an acid, and the gradual change of magnetiſm ſhould be carefully noted. The writer of this article has made ſome experiments of this nature, the reſults of which preſent ſome curious obſervations : but they are not yet brought to a concluſion that is fit to be laid before the public.

85 Hypotheſis of Prevôt.

Mr Prevôt of Geneva, in a diſſertation on the origin of magnetic forces, endeavours to give a theory which obviates the only difficulty in that of Æpinus ; but it is incomparably more complex, employing two fluids, which by their union compoſe a third, which he calls combined fluid. There is much ingenuity, and even mathematical addreſs, in adjuſting the relative properties of thoſe fluids. But ſome of them are palpably incompatible ; *ex. gr.* the particles of each attract each other, but thoſe of the other kind moſt ſtrongly ; yet they are both elaſtic like air. This is ſurely inconceivable.—Granting this, however, he ſuits his different attractions, ſo that a ſtrong elective attraction of the combined fluid for iron decompoſes part of the fluid in the iron, and each of its ingredients occupies oppoſite ends of the bar : then will the bars approach or recede, according as the near ends contain a different or the ſame ingredient. All this is operated without repulſion.

But the whole of this is mere accommodation, like Æpinus's, but ſo much more complex, that it requires very intenſe contemplation to follow the author through the conſequences. Add to this, that his attractions are operated by another fluid, infinitely more ſubtle than either of thoſe already mentioned, every particle of theſe being, as it were, a world in compariſon of thoſe of the other. In ſhort, he adopts all the extravagant ſuppoſitions of Le Sage of Geneva, and every thing is ultimately impulſion. Nor is the contrivance for obviating the difficulty (ſo often mentioned) at all clear and convincing ; and it is equally gratuitous with the reſt. We cannot think this hypotheſis at all intitled to the name of *explanation*.

86 Remarks on hypotheſes.

This muſt ſerve for an account of the hypotheſis of Æpinus. The philoſophical reader will ſee, that however exactly it may tally with every phenomenon, it cannot be called an explanation of the phenomena ; becauſe it is the phenomena which explain the hypotheſis, or give us the characters of the magnetic fluid, if ſuch fluid exiſts. But we are not obliged to admit this exiſtence, as we admit that to be the true decyphering of a letter which makes ſenſe of it. In that caſe we know both parts of the ſubject—the characters and the ſounds ; but are ignorant which correſponds to which. Did we ſee a fluid abſtracted from one part of a bar and conſtipated in another, and perceive the abſtraction and conſtipation always accompanied by the obſerved attractions and repulſions, the rules of philoſophical diſcuſſion, nay, the conſtitution of our own mind, would oblige us to aſſign the one as the cauſe or occaſion of the other. But this important circumſtance is wanting in the preſent caſe. We think, however, that it merits a cloſe attention ; and we entertain great hopes of its being one day completed, by including this ſingle exception.

At the ſame time, it muſt be owned, that it gives no extenſion of knowledge ; for it can have no greater extenſion than the phenomena on which it is founded, and cannot, without riſk of error, be applied to an untried caſe, of a kind diſſimilar in its nature to the phenomena on which it is founded. We doubt not but that its ingenious author would have ſaid, that a bit broken off from the north pole of a magnet would be wholly a north pole, if he had not known that the fact was otherwiſe.

But this hypotheſis greatly aids the imagination in conceiving the proceſs of the magnetical phenomena. The more we ſtudy them, the more do they appear to reſemble the protruſion of a fluid through the parts of an obſtructing body. It proceeds gradually. It may be, as it were, overdone, and regorges when the propelling cauſe is removed. The motion is aided by what we know to aid other obſtructed motions. As a fluid would be conſtipated in all protuberances, ſo the faculty of producing the phenomena is greater in all ſuch ſituations, &c. &c. This, joined to the impoſſibility of ſpeaking, with clearneſs of conception, of the propagation of powers without the protruſion of ſomething in which they inhere, gives it a hold of the imagination which is not eaſily ſhaken off.

To ſay that nothing is explained when the attraction of the fluid is not explained, and that this is the main queſtion, gives us little concern. We offer no explanation of this attraction, more than of the attraction of gravity. There is nothing contrary to the laws of human intellect, nothing inconſiſtent with the rules of reaſoning, in ſaying, that things are ſo conſtituted, that when two particles are together, they ſeparate, although we are ignorant of the immediate cauſe of their ſeparation. Thoſe who think that all motion is performed by impulſion, and who explain magnetiſm by a ſtream of fluid circulating round the magnet, muſt have another fluid to impel this fluid into its curvilineal path ; for they inſiſt, that the planets are ſo impelled. Then they muſt have a third fluid to deflect the vertical motions of the ſecond, and ſo on without end. This is evident, and it is abſurd. But we have ſaid enough in the article IMPULSION, *Suppl.* to ſhew that all *hypotheſes* framed on purpoſe to explain action *e diſtanti* by impulſion are illogical ; becauſe impulſion requires explanation as much as the other, and neither the one nor the other will ever be reſolved into any thing but the FIAT of the Allwiſe Author of the univerſe.

87 The preceding theory is not a hypotheſis.

We conclude with deſiring the reader to remark, that the explanation which we have given of the magnetical phenomena is independent of the hypotheſis of Æpinus, or any hypotheſis whatever. We have narrated a variety of very diſtinguiſhable facts, and have marked their diſtinctions. We have been able to reduce them to general claſſes ; and even to groupe thoſe claſſes into others ſtill more general ; and at laſt, to point out one which is diſcoverable in them all. This is giving a philoſophical theory, in the ſtricteſt ſenſe of the word ; becauſe we ſhew, in every caſe, the modification of the general fact which allots it this or that particular place in the claſſification. Thus we have ſhewn that the polarity or directive power of magnets is only a modification of the general fact of attraction and repulſion. Dr Gilbert's theory of *terreſtrial* magnetiſm is indeed a hypotheſis, and we enounced it as ſuch. It only claims probability, and we apprehend that a very high degree of credit will be given to it.

We hope that many of our readers will have their curioſity excited by the account we have given of Æpinus's theory. To ſuch we earneſtly recommend the ſerious peruſal of his book *Tentamen Theoriæ Electricitatis et Magnetiſmi, Auct. F. Æpino, Petropoli*, 1759. Van Swinden has included a very good abſtract of it in his 2d volume *Sur l'Electricité*, written by Profeſſor Steiglehner of Ratiſbon or Ingolſtadt. The mathematical part is greatly ſimplified, and the whole is preſented in a very clear and accurate manner. Mr Van Swinden is a profeſſed foe to all hypotheſes ; but he is not moderate, and we wiſh that we could ſay that he is candid. He attacks every thing ; and takes the opportunity of every analogy pointed out by Æpinus between magnetiſm and electricity to repeat the firſt ſentence of his diſſertation, namely, that magnetiſm and electricity are not the ſame ; a thing that Æpinus alſo maintains. But he even charges Æpinus with a miſtake in his fundamental equations, which invalidates his whole theory. He ſays that Æpinus has omitted one of the acting forces aſſumed in his hypotheſis. This is a moſt groundleſs charge : and we own that we cannot conceive how Van Swinden could fall into ſuch a miſtake. We are unwilling to call it intentional, for the mere purpoſe of raiſing a man of ſtraw to knock him down again. Abbé Haüy of the French Academy has alſo publiſhed an abridgment of Æpinus's theory, with many excellent remarks, tending to clear the theory of the only defect that has been found in it. This work was much approved of, and recommended by the Academy. We have not had the good fortune to ſee a copy of it.

88 Analogy of magnetiſm and electricity.

The reader cannot but have remarked the cloſe analogy between the magnetical phenomena and thoſe of induced electricity ; indeed, all the phenomena of attraction and repulſion are the ſame in both. The mechanical compoſition of thoſe actions produces a directive power and a polarity, in electrical as well as in magnetical bodies. We can make an electrical needle which will arrange itſelf, with reſpect to the overcharged and undercharged ends of a body electrified by mere poſition, juſt as a compaſs needle is arranged by a magnet. We can touch a ſtick of ſealing wax in the manner of the double touch, ſo as to give it poles of conſiderable force and durability. As a red hot ſteel bar acquires permanent poles by quenching it near a magnet, ſo melted wax acquires them by freezing in the neighbourhood of a poſitive and negative electric. Some have inferred a ſameneſs of origin of theſe two ſpecies of powers from thoſe various circumſtances of reſemblance ; but the original cauſes ſeem to be diſtinct on many accounts. Electricity is common to all bodies. The cauſe of magnetiſm can operate only on iron. Although lightning or an electrical ſhock gives polarity to a needle, we need not infer the identity of the cauſe, becauſe the polarity which it gives is always the ſame with that given by great heat ; and there is always intenſe heat in this operation. The phenomenon which looks the moſt like an indication of identity of the origin of electricity and magnetiſm is the direction of the rays of the aurora borealis—

borealis—they converge to the ſame point of the heavens to which the elevated pole of the dipping needle directs itſelf. But this is by no means a ſufficient foundation for eſtabliſhing a ſameneſs. Electricity and magnetiſm may, however, be related by means of ſome powers hitherto unknown. But we are decidedly of opinion, that the electric and magnetic fluid are totally different, although their mechanical actions are ſo like that there is hardly a phenomenon in the one which has not an exact counterpart in the other. But we ſee them both operating, with all their marks of diſtinction, in the ſame body; for iron and loadſtones may be electrified, like any other body, and their magnetiſm ſuffers no change or modification. We can ſet theſe two forces in oppoſition or compoſition, juſt as we can oppoſe or compound gravity with either. While the iron filings are arranging themſelves round a magnet, the mechanical action of electricity may be employed either to promote or hinder the arrangement. They are therefore diſtinct powers, inherent in different ſubjects.

89 They are not, however, effects of the ſame cauſe.

But there are abundance of other phenomena which ſhew this diverſity. There is nothing in magnetiſm like a body overcharged or undercharged *in toto*. There is nothing which indicates the preſence of the fluid to the other ſenſes—nothing like the ſpark, the ſnap, the viſible diſſipation; becauſe the magnetic fluid enters into no union with air, or any thing but iron. There is nothing reſembling that inconceivably rapid motion which we ſee in electricity; the quickeſt motion of magnetiſm ſeems inferior (even beyond compariſon) with the ſloweſt motion along any electric conductor. Therefore there is no poſſibility of diſcharging a magnet as we diſcharge a coated plate. Indeed, the reſemblance between a magnet and a coated plate of glaſs is exceedingly ſlight. The only reſemblance is between the magnet and an inconceivably thin ſtratum of the glaſs, which ſtratum is poſitive in one ſide and negative in the other. The only perfect reſemblance is between the induced magnetiſm of common iron, and the induced electricity of a conductor.

The following ſeem the moſt inſtructive diſſertations on magnetiſm, either as valuable collections of obſervations, or as judicious reaſonings from them, or as the ſpeculations of eminent or ingenious men concerning the nature of magnetiſm.

Gilbertus de Magnete, Lond. 1600, fol.
Æpini Tentamen Theoriæ Magn. et Electr.
Eberhard's Tentam. Theor. Magnetiſmi, 1720.
Diſſertations ſur l'aimant, par du Fay, 1728.
Muſchenbroek Diſſert. Phyſico Experimentalis de Magnete.
Pieces qui ont emporté le prix de l'Acad. des Sciences à Paris ſur la meilleure conſtruction des Bouſſoles de declination. Recueil des pieces courounées, tom. v.
Euleri opuſcula, tom. iii. continens Theoriam Magnetis, Berlin, 1751.
Æpini Oratio Academica, 1758.
Æpini item Comment. Petrop. nov. tom. x.
Anton. Brugmanni tentam. Phil. de materia Magnetica, Francqueræ, 1765.
There is a German tranſlation of this work by Eiſenbach, with many very valuable additions.
Scarella de Magnete, 2 tom. fol.
Van Swinden Tentamina Magnetica, 4to.
Van Swinden ſur l'Analogie entre les phenomenes Electriques et Magnetiques, 3 tom. 8vo.
Diſſertation ſur les Aimans artificiells par Antheaume.
Experiences ſur les Aimans artificielles par Nicholas, Fuſs, 1782.
Eſſai ſur l'Origine des Forces Magnetiques par Mr Prevoſt.
Sur les Aimans artificielles par Rivoir, Paris 1752.
Diſſertatio de Magnetiſmo par Sam. Klingenſtier et Jo. Brander, Holm. 1752.
Deſcription des Courants Magnetiques, Straſbourg, 1753.
Traité de l'Aiman par Dalancé, Amſt. 1687.

Beſides theſe original works, we have ſeveral diſſertations on magnetical vortices by Des Cartes, Bernoulli, Euler, Du Tour, &c. publiſhed in the collections of the works of thoſe authors, and many diſſertations in the memoirs of different academies; and there are many popular treatiſes by the traders in experimental philoſophy in London and Paris. Dr Gown Knight, the perſon in Europe who was moſt eminently ſkilled in the knowledge of the phenomena, alſo publiſhed a diſſertation intitled, *An attempt to explain the Phenomena of Nature by two principles, Attraction and Repulſion*, Lond. 1748, 4to, in which he has included a theory of magnetiſm. It is a very curious work, and ſhould be ſtudied by all thoſe who have recourſe without ſcruple to the agency of inviſible fluids, when they are tired of patient thinking. They would there ſee what thought and combination are neceſſary before an inviſible fluid can be really fitted for performing any office we chooſe to aſſign it. And they will get real inſtruction as to what ſervices we may expect of ſuch agents, and from what taſks they muſt be excluded. The Doctor's theory of magnetiſm is very unlike the reſt of the performance; for he does not avail himſelf of the vaſt apparatus of propoſitions which he had eſtabliſhed, and adopts without any nice adjuſtment the moſt common notions of an impulſive vortex. Both the production and maintenance of this vortex, and its mode of operation, are irreconcileable with the acknowledged laws of impulſion.

Si quid noviſti rectius iſtis, candidus imperti—ſi non—his utere mecum.

APPENDIX.

Inveſtigation of the magnetic curve.

We have been favoured with the following inveſtigation of the curves, to which a needle of indefinite minuteneſs will be a tangent, by Mr Playfair, Profeſſor of Mathematics in the Univerſity of Edinburgh.

Two magnetical poles being given in poſition, the force of each of which is ſuppoſed to be as the mth power of the diſtance from it reciprocally, it is required to find a curve, in any point of which a needle (indefinitely ſhort) being placed, its direction, when at reſt, may be a tangent to the curve?

1. Let A and B (fig. 35.) be the poles of a magnet, C any point in the curve required; then we may ſuppoſe the one of theſe poles to act on the needle only by repulſion, and the other only by attraction, and the direction of the needle, when at reſt, will be the diagonal

of a parallelogram, the ſides of which repreſent theſe forces. Therefore, having joined AC and BC, let AD be drawn parallel to BC, and make $\frac{1}{\mathrm{AC}^m} : \frac{1}{\mathrm{BC}^m} :: \mathrm{AC} : \mathrm{AD}$; join CD, then CDF will touch the curve in C.

2. Hence an expreſſion for AF may be obtained. For, by the conſtruction, $\mathrm{AD} = \frac{\mathrm{AC}^{m+1}}{\mathrm{BC}^m}$, and ſince $\mathrm{BC} : \mathrm{AD} :: \mathrm{BF} : \mathrm{FA}$, and $\mathrm{BC} - \mathrm{AD} : \mathrm{AD} :: \mathrm{AB} : \mathrm{AF}$, we have $\mathrm{AF} = \frac{\mathrm{AB} \times \mathrm{AC}^{m+1}}{\mathrm{BC}^{m+1} - \mathrm{AC}^{m+1}}$.

3. A fluxionary expreſſion for AF may alſo be found in terms of the angles CAB, ABC. In CF take the indefinitely ſmall part CH, draw AH, BH, and from C draw CL perpendicular to AH and CK to BH. Draw alſo BC and AM at right angles to FH. Let the angles $\mathrm{CAB} = \phi$, and $\mathrm{CBA} = \psi$; then $\mathrm{CAH} = \dot{\phi}$, and $\mathrm{CBH} = -\dot{\psi}$; alſo $\mathrm{CL} = \mathrm{AC} \times \dot{\phi}$, and $\mathrm{CK} = -\mathrm{BC} \times \dot{\psi}$. Now $\mathrm{HC} : \mathrm{CL} :: \mathrm{AC} : \mathrm{AM} = \frac{\mathrm{AC}^2 \times \dot{\phi}}{\mathrm{HC}}$; and for the ſame reaſon $\mathrm{BC} = -\frac{\mathrm{BC}^2 \times \dot{\psi}}{\mathrm{HC}}$. Therefore ſince $\mathrm{AF} : \mathrm{FB} :: \mathrm{AM} : \mathrm{BC}$, $\mathrm{AF} : \mathrm{FB} :: \frac{\mathrm{AC}^2 \times \dot{\phi}}{\mathrm{HC}} - \frac{\mathrm{BC}^2 \times \dot{\psi}}{\mathrm{HC}}$, and $\mathrm{AF} : \mathrm{AB} :: \text{ſin.}\, \psi^2 \dot{\phi} : -\text{ſin.}\, \psi^2 \dot{\phi} - \text{ſin.}\, \phi^2 \dot{\psi}$; wherefore if $\mathrm{AB} = a$, $\mathrm{AF} = \frac{-a \dot{\phi}\, \text{ſin.}\, \psi^2}{\dot{\psi}\, \text{ſin.}\, \phi^2 + \dot{\phi}\, \text{ſin.}\, \psi^2}$.

4. If this value of AF be put equal to that already found, a fluxionary equation will be obtained, by the integration of which the curve may be conſtructed. Becauſe $\mathrm{AF} = \frac{\mathrm{AB} \times \mathrm{AC}^{m+1}}{\mathrm{B}e^{m+1} - \mathrm{A}e^{m+1}}$; and ſince $\mathrm{AC} = \frac{a\, \text{ſin.}\, \psi}{\text{ſin.}\, (\phi + \psi)}$, and $\mathrm{BC} = \frac{a\, \text{ſin.}\, \phi}{\text{ſin.}\, (\phi + \psi)}$, we have by ſubſtitution $\mathrm{AF} = \frac{a\, \text{ſin.}\, \psi^{m+1}}{\text{ſin.}\, \phi^{m+1} - \text{ſin.}\, \psi^{m+1}} = -\frac{a \dot{\phi}\, \text{ſin.}\, \psi^2}{\dot{\psi}\, \text{ſin.}\, \phi^2 + \dot{\phi}\, \text{ſin.}\, \psi^2}$. Hence, $\text{ſin.}\, \phi^2 \times \dot{\psi}\, \text{ſin.}\, \psi^{m+1} + \dot{\phi}\, \text{ſin.}\, \psi^{m+3} = -\text{ſin.}\, \psi^2 \times \dot{\phi}\, \text{ſin.}\, \phi^{m+1} + \dot{\phi}\, \text{ſin.}\, \psi^{m+3}$, and therefore $\dot{\psi}\, \text{ſin.}\, \psi^{m-1} = -\dot{\phi}\, \text{ſin.}\, \phi^{m-1}$; and alſo, $\int \dot{\psi}\, \text{ſin.}\, \psi^{m-1} + \int \dot{\phi}\, \text{ſin.}\, \phi^{m-1} = \mathrm{C}$.

5. Theſe fluents are eaſily found when m is any whole poſitive number.

If $m = 1$, we have $\dot{\psi} + \dot{\phi} = 0$.
$m = 2$, $\dot{\psi}\, \text{ſin.}\, \psi + \dot{\phi}\, \text{ſin.}\, \phi = 0$.
$m = 3$, $\dot{\psi}\, \text{ſin.}\, \psi^2 + \dot{\phi}\, \text{ſin.}\, \phi^2 = 0$.
$m = 4$, $\dot{\psi}\, \text{ſin.}\, \psi^3 + \dot{\phi}\, \text{ſin.}\, \phi^3 = 0$, &c.
Therefore, &c.
Alſo if $m = 1$, $\phi + \psi = \mathrm{C}$.
$m = 2$, $\text{coſ.}\, \phi = \text{coſ.}\, \psi = \mathrm{C}$.
$m = 3$, $-\text{ſin.}\, 2\phi + 2\phi - \text{ſin.}\, 2\psi + 2\psi = \mathrm{C}$.
$m = 4$, $\text{coſ.}\, 3\phi - 9\, \text{coſ.}\, \phi + \text{coſ.}\, 3\psi - 9\, \text{coſ.}\, \psi = \mathrm{C}$, &c. &c.

The firſt of the above equations belongs to a ſegment of a circle deſcribed upon AB, which therefore would be the curve required if the magnetical force were inverſely as the diſtances.

If the magnetical force be inverſely as the ſquare of the diſtance, that is, if $m = 2$, $\text{coſ.}\, \phi + \text{coſ.}\, \psi$ is equal to a conſtant quantity. Hence if, beſide the points A and B, any other point be given in the curve, the whole may be deſcribed. For inſtance, let the point E (fig. 36.) be given in the curve, and in the line DE which biſects AB at right angles. Deſcribe from the centre A a circle through E, viz. QER; then AD being the coſine of DAE to the radius AE, the ſum of the coſines of $\phi \times \psi$ will be everywhere (to the ſame radius) $= 2\,\mathrm{AD} = \mathrm{AB}$. Therefore to find E′, the point in which any other line AN, making a given angle with AB, meets the curve, draw from N, the point in which it meets the circumference of the circle QER, NO, perpendicular to AB, ſo that AO may be the coſine of NAO, and from O toward A take $\mathrm{OP} = \mathrm{AB}$, then AP will be the coſine of the angle ABE′; ſo to find BE′, draw PQ perpendicular to AP, meeting the circle in Q; join AQ, and draw BE′ parallel to AQ, meeting AE′ in E′, the point E′ is in the curve. In this way the other points of the curve may be found.

The curve will paſs through B, and will cut AB at an angle of which the coſine = RB. If then E be ſuch, that AE = AB, the curve will cut AB at right angles. If E″ be more remote from A, the curve will make with AB an obtuſe angle toward D; in other caſes it will make with it an acute angle.

A conſtruction ſomewhat more expeditious may be had by deſcribing the ſemicircle AFB, cutting AE in F, and AE′ in N, and deſcribing a circle round A, with the diſtance $\mathrm{AL} = 2\,\mathrm{AF}$, cutting AE′ in b. If AG be applied in the ſemicircle $\mathrm{AFB} = \mathrm{N}b$, AG muſt cut AN in a point E′ of the curve, becauſe $\mathrm{AN} + \mathrm{BG} = 2\,\mathrm{AF}$, and AN and GB are coſines of the angles at A and B.

As the lines AN and BG may be applied either above or below AB, there is another ſituation of their interſection E′. Thus An being applied above, and Bg below, the interſection is in e'. The curve has a branch extending below A; and if De be made = DE, and Be be drawn, it will be an aſſymptote to this branch. There is a ſimilar branch below B. But theſe portions of the curve evidently ſuppoſe an oppoſite direction of one of the two magnetic forces, and therefore have no connection with the poſition of the needle.

Addition to n° 65.

We omitted the inſerting in its proper place, n° 65. a hypotheſis of the celebrated aſtronomer Tobias Mayer of Gottingen, by which the direction of the mariner's needle in all parts of the earth may be determined. He ſuppoſes that the earth contains a very powerful magnet of inconſiderable dimenſions, which arranges the needle according to the known laws of magnetiſm. The centre of this magnet was diſtant from the centre of the earth about 480 Engliſh miles in 1756, and a line joining theſe centres interſected the earth's ſurface in a point ſituated in 17° N. Lat. and 183° E. Long. from London. The axis of the magnet is perpendicular to this line, and the plane in which it lies is inclined about 11° to the plane of the meridian, the north end of the axis lying on the eaſt ſide of that meridian. From theſe data, it will be found that the axis of this magnet cuts the ſurface of the earth about the middle of the eaſtern ſhore of Baffin's Bay, and in another point about 800 miles S. S. W. of the ſouthern point of New Zealand. Profeſſor Lichtenberg of Gottingen, who gives this extract from the manuſcript, ſays, that

MAGNETISM. PLATE XXXIV.

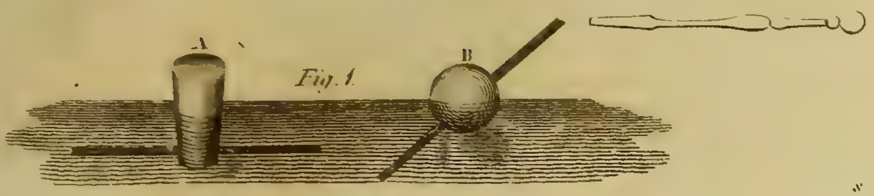


Fig. 1.

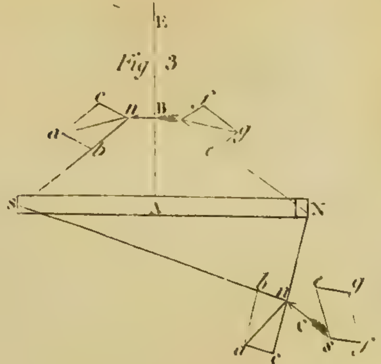


Fig. 3

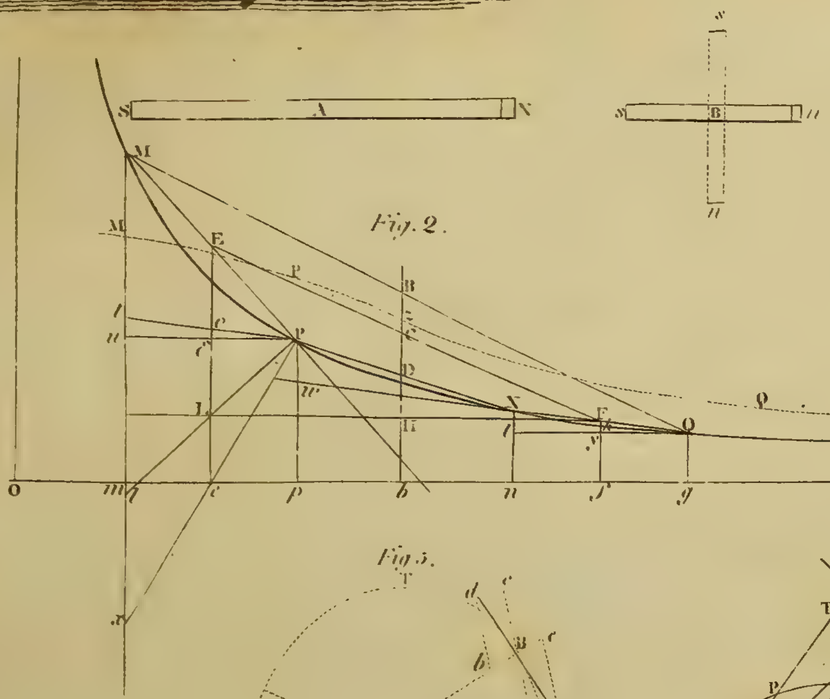


Fig. 2.

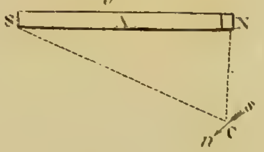


Fig. 4.

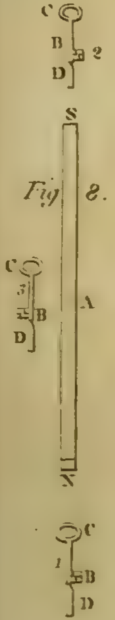


Fig. 8.

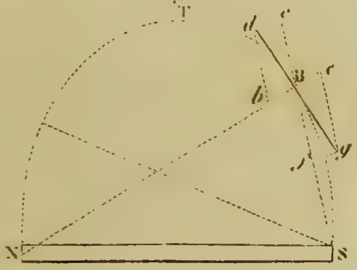


Fig. 5.

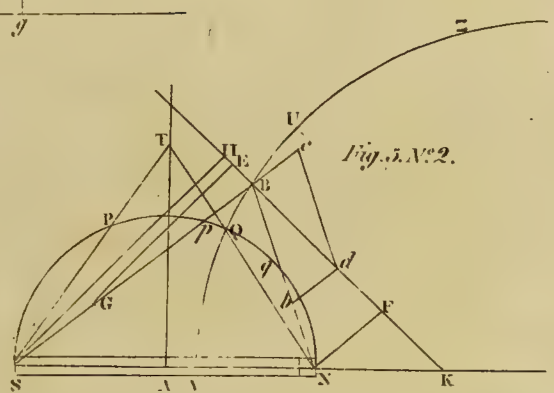


Fig. 5. No. 2.

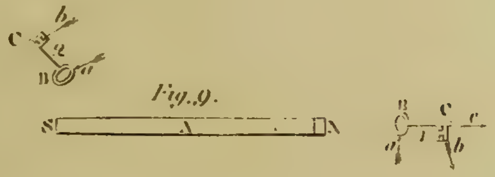


Fig. 9.

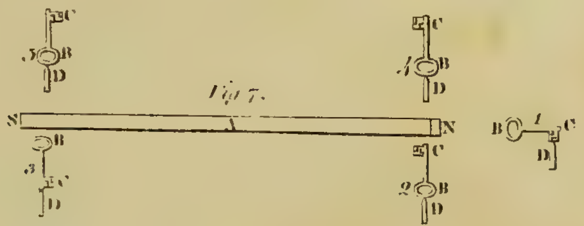


Fig. 7.

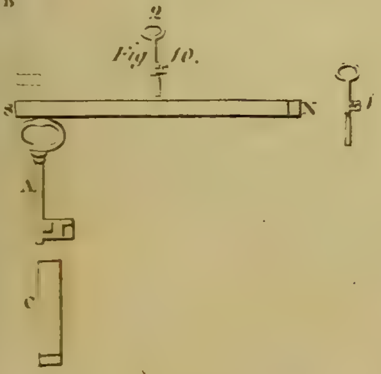


Fig. 10.

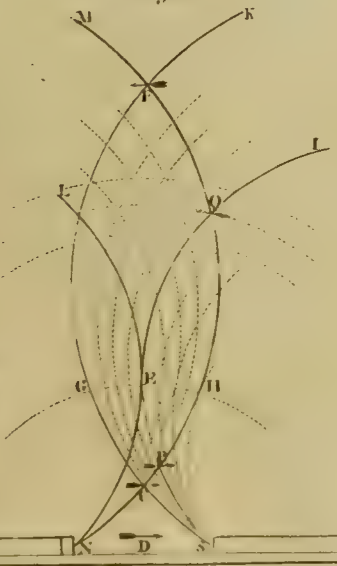
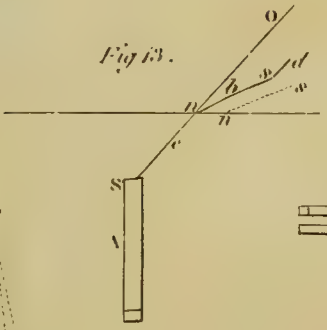


Fig. 6.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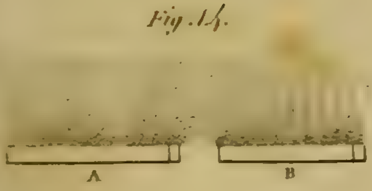
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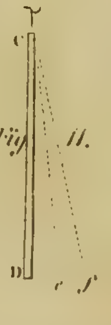


Fig. 11.

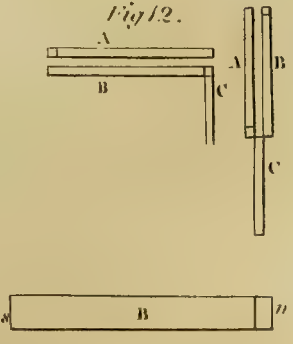


Fig. 12.

MAGNETISM PLATE XXXV

Fig. 15.

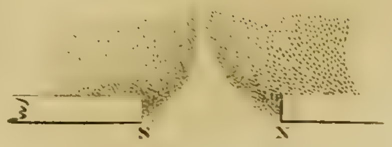


Fig. 17.

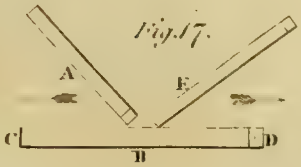
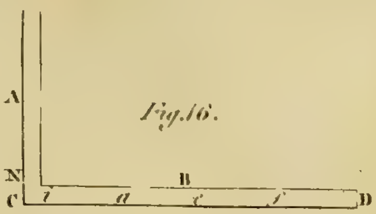


Fig. 16.



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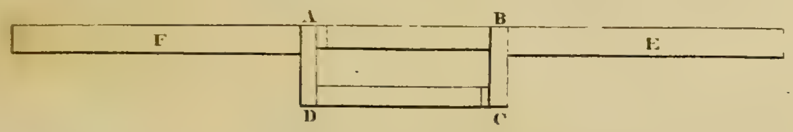


Fig. 21.

Fig. 22.

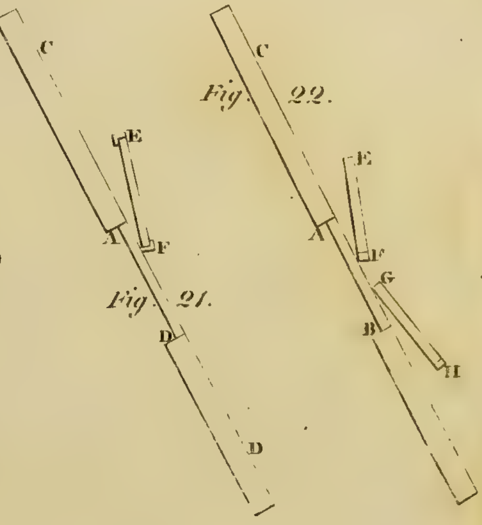


Fig. 19.

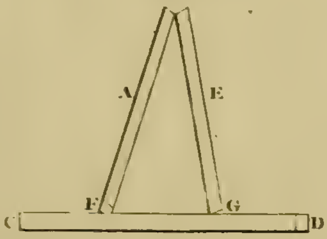


Fig. 20.

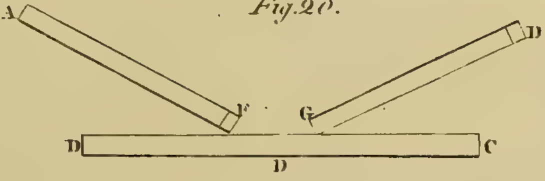
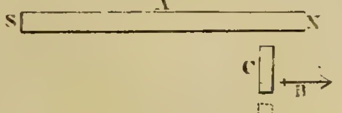


Fig. 24.



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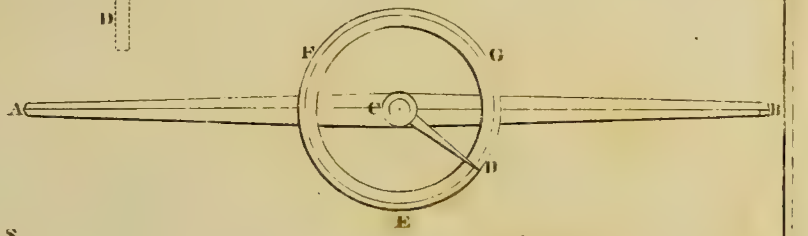
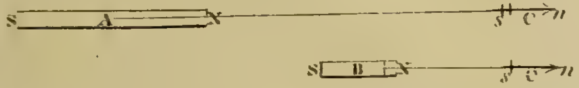


Fig. 25.



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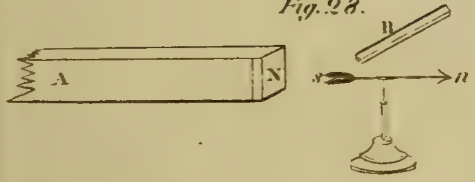

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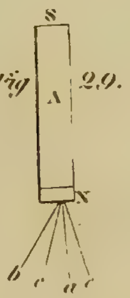


Fig. 26.

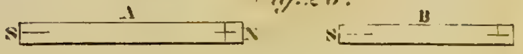


Fig. 27.

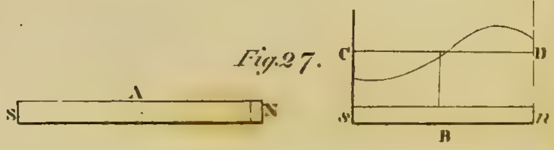


Fig. 32.

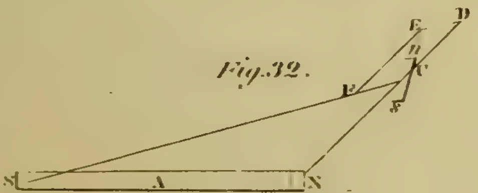


Fig. 34.

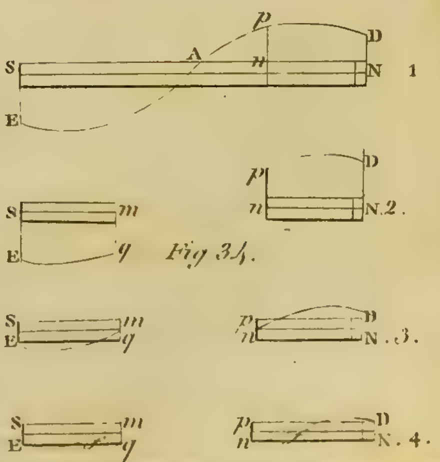


Fig. 33.

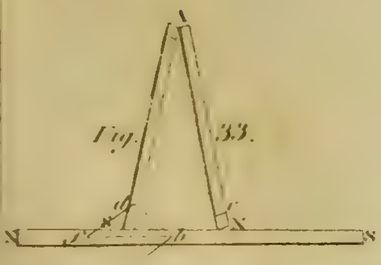


Fig. 30.

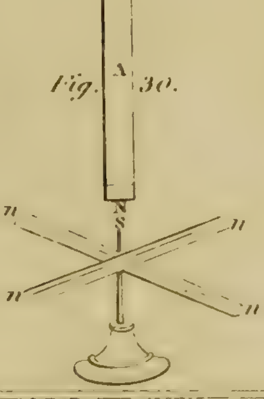
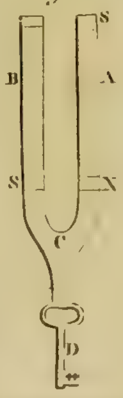


Fig. 31.



the hypotheſis is accompanied by a conſiderable liſt of variations and dips calculated by it, and compared with obſervations, and that the agreement is very remarkable. He gives indeed a dozen inſtances in very different regions of the earth. But we ſuſpect that there is ſome error or defect in the data given by him, becauſe the annual changes, which he alſo gives, are ſuch as are inconſiſtent with the data, and even with each other. He ſays, that the diſtance from the centre increaſes about four miles annually, and that *thence* ariſes an annual diminution of 8 minutes in the latitude and 14 in the longitude of that point where the ſtraight line joining the centres meets the ſurface. It can have no ſuch conſequence. He ſays alſo, that the above mentioned inclination of the planes increaſes 8 minutes annually. The compound force of the magnet is ſaid to be as the ſquare root of the diſtance inverſely. We are at a loſs to underſtand the meaning of this circumſtance; becauſe Mayer's hypotheſis concerning the law of magnetic action is exceedingly different, as related by Mr Lichtenberg from the ſame manuſcript. But it was our duty to communicate this notice, though imperfect, of the ſpeculations of this celebrated mathematician. See *Exliben's Elem. of Nat. Phil.* publiſhed by Lichtenberg 1784, p. 645.

Addition to n°. 64.

Addition to n° 64.

Let HZOF (fig. 37.) be the plane of a magnetic meridian, H n' O the plane of the horizon, and NS the poſition of the magnetic needle in any place, when it is at liberty to ſettle in the true magnetic direction. The angle HON is the inclination or dip of the needle. Let Z n F be a vertical circle, in which a well conſtructed dipping needle can freely play up and down. This needle cannot place itſelf in the magnetic direction, becauſe it can only move in a vertical plane. Its north point is impelled in the direction no, and its ſouth point in the direction sp, both of which are parallel to NS. By the laws of mechanical equilibrium, it cannot reſt, except in ſuch a poſition that the forces no and sp are in a plane perpendicular to the plane Z n F. In any other poſition, there would be a force impelling the needle toward that ſide on which no makes an acute angle with the tangent rnt of the vertical circle. Therefore the ſpherical triangle N n F is right angled in n, and Coſ. NFn : R = Tan. nF : Tan. NF, = Tan. HN : Tan. $n'n$. Therefore

$$\text{Tan. } n'n = \frac{\text{Tan. HN}}{\text{Coſ. H}n'}, = \text{Tan. HN} \times \text{Sec. H}n'.$$

Therefore, in any place, the real inclination of the magnetical direction to the horizon is different from what is pointed out by a dipping needle when it is in a plane which declines from the magnetic meridian; and the tangent of the obſerved dip of the needle exceeds that of the inclination of the magnetic direction in the proportion of radius to the coſine of the deviation HC n', or the proportion of the ſecant of this angle to the radius. If therefore the dipping needle play in a magnetic eaſt and weſt circle, it will ſtand perpendicular to the horizon.

Maguana, ‖ Maine.

MAGUANA, *St John of*, a canton and town on the S. ſide of the iſland of St Domingo, is ſituated on the left ſide of the river Neybe. The capital of the ancient Indian kingdom of Maguana, ſtood where the town St John of Maguana is ſituated. The ancient capital diſappeared with the unfortunate prince Anacoana. This canton was pillaged by the Engliſh privateers, in 1543. In 1764 the diſtrict of the new pariſh contained 3600 perſons, of whom 300 were capable of bearing arms. Its population amounts now to more than 5000 ſouls.—*Morse.*

MAHACKAMACK, a river which falls into the Delaware from the N. E. at the N. W. corner of the State of New-Jerſey.—*ib.*

MAHONE BAY, on the coaſt of Nova-Scotia, is ſeparated from Margaret's bay by the promontory on which is the high land of Aſpotagoen.—*ib*

MAHONING, a townſhip on Suſquehannah river, in Pennſylvania.—*ib.*

MAHONOY, a townſhip on Suſquehannah river, in Pennſylvania.—*ib.*

MAIDENHEAD, a ſmall neat village in Hunterdon county, New Jerſey, having a Preſbyterian church, half way between Princeton and Trenton, on the great poſt road from New-York to Philadelphia; ſix miles from each. The townſhip of Maidenhead contains 1032 inhabitants, including 160 ſlaves.—*ib.*

MAIDSTONE, a townſhip in Eſſex county, in Vermont, on Connecticut river, containing 125 inhabitants.—*ib.*

Maine.

MAINE, District of, belonging to Maſſachuſetts, is ſituated between lat. 43° and 48° 15′ north, and between long. 64° 55′ and 70° 39′ weſt; bounded north by Lower Canada, eaſt by the province of New-Brunſwick, ſouth by the Atlantic Ocean, weſt by New-Hampſhire. The Diſtrict of Maine is in length, on an average, 200 miles, and its average breadth 200 miles: containing 40,000 ſquare miles, or 25,600,000 acres. It is divided into 5 counties, viz. York, Cumberland, Lincoln, Hancock, and Waſhington; theſe are ſubdivided into near 200 incorporated townſhips and plantations; inhabited by 96,540 free people. The chief towns are Portland the metropolis of the Diſtrict of Maine, York, Pownalborough and Wiſcaſſet, Hallowell, Bath, Waldoborough, Penobſcot, and Machias. The laſt mentioned is the only incorporated town in Waſhington county, the other ſettlements being only plantations. The chief rivers are Penobſcot, Kennebeck, Saco, Androſcoggin, St Croix, &c. beſides a vaſt number of ſmall rivers. The moſt noted lakes are Mooſehead, Scoodic, Sebacook, and Umbagog. The chief bays are thoſe of Caſco, Penobſcot, Machias, Saco, and Paſſamaquoddy. The moſt remarkable capes are thoſe of Neddock, Porpoiſe, Elizabeth, Small Point, Pemaquid, and Petit Manan. The Diſtrict of Maine, though an elevated tract of county, cannot be called mountainous. A great proportion of the lands are arable and exceedingly fertile, particularly between Penobſcot and Kennebeck rivers. On ſome parts of the ſea-coaſt, the lands are but indifferent.

ent. The lands in this Diſtrict may be conſidered in three diviſions: the *firſt* comprehending the tract lying E. of Penobſcot river, of about 4,500,000 acres; the *ſecond*, and beſt tract, of about 4,000,000 acres, lying between Penobſcot and Kennebeck rivers; the *third*, firſt ſettled and moſt populous at preſent, weſt of Kennebeck river, containing alſo about 4,000,000 acres. The ſoil of this country, in general, where it is properly fitted to receive the ſeed, appears to be very friendly to the growth of wheat, rye, barley, oats, peas, hemp, and flax, as well as for the production of almoſt all kinds of culinary roots and plants, and for Engliſh graſs; and alſo for Indian corn, eſpecially if the ſeed be procured from a more northern climate. Hops are the ſpontaneous growth of this country; and it alſo uncommonly good for grazing, and large ſtocks of neat cattle may be fed both ſummer and winter. The natural growth of this Diſtrict conſiſts of white pine and ſpruce trees in large quantities, ſuitable for maſts, boards, and ſhingles; maple, beech, white and grey oak, and yellow birch. The low lands produce fir, which is neither fit for timber nor fuel, but yields a balſam that is highly prized. Almoſt the whole coaſt N. E. of Portland is lined with iſlands, among which veſſels may generally anchor with ſafety. The principal exports of this country are various kinds of lumber, as pine boards, ſhip timber, and every ſpecies of ſplit lumber manufactured from pine and oak; theſe are exported from the various ports in immenſe quantities. A ſpirit of improvement is increaſing here. A charter for a college has been granted by the legiſlature, and five academies incorporated and endowed with handſome grants of public lands. Town ſchools are generally maintained in moſt of the towns. The Commonwealth of Maſſachuſetts poſſeſs between eight and nine million acres in this Diſtrict, independent of what they have ſold or contracted to ſell, which brings into the treaſury the neat ſum of £269,005 : 8 : 7 currency; and beſides about two million acres between St Croix and Paſſamaquoddy in diſpute between the U. States and the Britiſh nation. Excluſive of the lands ſold, about 385,000 acres have been granted for the encouragement of literature and other uſeful and humane purpoſes. Attempts were made to ſettle this country as early as 1607, on the W. ſide of Kennebeck river; but they proved unſucceſsful, and were not repeated till between 1620 and 1630. In 1635, the weſtern part of it was granted to Ferdinando Gorges, by the Plymouth Company, and he firſt inſtituted government in this province. In 1652, this province came under the juriſdiction of Maſſachuſetts, and was, by charter, incorporated with it, in 1691. It has ſince increaſed to upwards of 100,000 inhabitants, and will, it is expected, ſhortly be erected into a ſeparate State.—*ib.*

MAIRE, *Le*, a ſtrait between Terra del Fuego and Staten-Iſland, in S. America.—*ib.*

MAISY, *Cape*, is the eaſternmoſt point of the iſland of Cuba.—*ib.*

MAJABAGADUCE, in the Diſtrict of Maine, at the mouth of Penobſcot river, on the eaſt ſide.—*ib.*

MAKEFIELD, *Upper* and *Lower*, townſhips in Buck's county, Pennſylvania.—*ib.*

MALABAR, *Cape*, or *Sandy Point*, a narrow ſtrip of land projecting out from the ſouth-eaſt part of Cape Cod, in Maſſachuſetts, about 8 miles S. by W. N. lat. 41° 33′, W. long. from Greenwich 70° 3′.—*ib.*

MALAMBITO, a town in the province of Carthagena, in Terra Firma, about 60 miles eaſterly of Carthagena, and on the W. ſide of the river Magdalena. —*ib.*

MALDEN, a town in Middleſex county, Maſſachuſetts, on the eaſtern poſt-road, 4 miles north of Boſton, containing 1,033 inhabitants. It is connected with Charleſtown by a bridge over Myſtic river, built in 1787.—*ib.*

MALDONADO, a bay in the river La Plata, eaſtward of Buenos Ayres, in S. America, and 9 leagues from Cape Santa Maria.—*ib.*

MALESHERBES (Chriſtian William de Lamoignon) was born December the 6th 1721. At the age of 24 he became a counſellor of Parliament, and ſix years afterwards chief preſident of the *cour des aides.* He remained in that important ſituation during a period of 25 years, and diſplayed on many occaſions proofs of firmneſs, eloquence, and wiſdom.

When the prince of Condé was ſent by the king in 1768 to ſilence the magiſtrates who oppoſed the taxes, Maleſherbes replied to him, "Truth, Sir, muſt indeed be formidable, ſince ſo many efforts are made to prevent its approach to the throne." About the ſame time that he became preſident of the *cour des aides*, he was appointed by his father, then chancellor of France, ſuperintendant of the preſs; an office of the greateſt importance, of which the principles which Maleſherbes had imbibed from D'Alembert rendered him very ill qualified to diſcharge the duties. He was what the French called a *philoſopher*; a term with them of the ſame import with a naturaliſt, who openly denies revealed religion, and has no adequate notions of the moral attributes of God. The conſequence was, that when the authors of impious and immoral books were brought before him in his official capacity to undergo examination, he appeared to them as adviſing, aſſiſting, and protecting them, againſt that very power which was veſted in himſelf; and they were commonly diſmiſſed with this ſenſeleſs obſervation, that all books of whatever tendency ſhould be conſidered merely as *objects of commerce.* Had it not been for the protecting influence of Maleſherbes, the *Encyclopedie*, of which the publication was frequently ſuſpended (ſee Diderot in this *Supplement*), would probably have been altogether ſuppreſſed; and the works of Rouſſeau and Raynal, which ſo powerfully contributed to that revolution in which he was overwhelmed, would certainly not have ſpread ſo rapidly over the kingdom of France. It was he, ſaid D'Alembert, who *broke the ſhackles of literature.*

In vain will it be replied, that he left the ſame liberty to the religious as to the impious writers; for that was not always ſtrictly true. The Abbé Barruel has brought the teſtimony of D'Alembert himſelf to prove, that it was much againſt his will that Maleſherbes ſuffered works refuting the ſophiſters to appear; and, as he very properly obſerves, what a miniſter allows with reluctance, he finds abundant means of preventing.

In 1775 he reſigned the office of chief preſident of the *cour des aides*, and was appointed miniſter and ſecretary of ſtate in the place of La Vrillière. Thus placed in the centre of a frivolous yet brilliant court, Maleſherbes did not in the leaſt deviate from his former ſimplicity of life and manners; but, in lieu of complying with the eſtabliſhed etiquette which required magiſtrates, when they became miniſters of ſtate, to exchange their ſable habit and head dreſs for a coloured ſuit, bag-wig, and ſword, he retained his black coat and magiſterial *peruke!* This is recorded by a panegyriſt to his honour; but we perceive not the honour which it reflects on him. It ſurely requires no great powers of abſtraction to diſcover, that a coloured coat, bag-wig, and ſword, are not in themſelves more frivolous or contrary to nature, than a black coat and enormous peruke; and if the manners of a country have appropriated theſe different dreſſes to different ſtations in life, the individual muſt be actuated by a very abſurd kind of pride, who ſets up his own caprice againſt the public opinion.

As, when inveſted with the power to reſtrain within juſt limits the freedom of the preſs, it was his chief aim to encourage and extend that freedom; ſo, when raiſed to an office which gave him the unlimited power of iſſuing *lettres de cachet*, it was their total ſuppreſſion that became the earlieſt object of his *moſt ardent* zeal. Till that time *lettres de cachet*, being conſidered as a part of the general police, as well as of the royal prerogative, were iſſued not only at the will of the miniſter, but even at the pleaſure of a common clerk, or perſons ſtill more inſignificant. Maleſherbes began by relinquiſhing himſelf this abſurd and iniquitous privilege. He delegated the right to a kind of tribunal, compoſed of the moſt upright magiſtrates, whoſe opinion was to be unanimous, and founded upon open and well eſtabliſhed facts. He had but one more object to attain, and that was to ſubſtitute a legal tribunal in the place of that which he had eſtabliſhed; and this object he was upon the point of accompliſhing, when the intrigues of the court procured the diſmiſſion of Turgot; and Maleſherbes, in conſequence, reſigned on the 12th of May 1776. For this part of his conduct he is intitled to praiſe, which we feel not ourſelves inclined to withhold from his memory. Even M. Barruel admits, that he had many moral virtues, and that he diſplayed real benevolence when alleviating the rigours of impriſonment, and remedying the abuſe of *lettres de cachet;* but France, ſays he, ſhall nevertheleſs demand of him her temples that have been deſtroyed; for it was he who, above all other miniſters, abuſed his authority to eſtabliſh in that kingdom the reign of impiety.

After this epoch he undertook ſeveral journeys into different parts of France, Holland, and Switzerland, where he collected with zeal and taſte objects of every kind intereſting to arts and ſciences. As he travelled with the ſimplicity and economy of a man of letters, who had emerged from obſcurity for the purpoſe of making obſervations and acquiring knowledge, he by that means was enabled to reſerve his fortune for important occaſions, in which it might procure him information on intereſting ſubjects. He travelled ſlowly, and frequently on foot, that his obſervations might be the more minute; and employed part of his time in ſuitably arranging them. Theſe obſervations formed a valuable collection of intereſting matter relative to the arts and ſciences, but which has been almoſt totally deſtroyed by the fury of revolutioniſts, who have done as much prejudice to the intereſts of ſcience as of humanity.

Returning from his travels, Maleſherbes for ſeveral years enjoyed a philoſophic leiſure, which he well knew how to direct to uſeful and important objects. The two treatiſes which he compoſed in the years 1785 and 1786 on the civil ſtate of the proteſtants in France are well known. The law which he propoſed in theſe, was only preparatory to a more extenſive reform; and theſe treatiſes were to have been followed up by another work, the plan of which he had already laid down, when affairs growing too difficult to be managed by thoſe who held the reins of government, they were compelled to call him to their councils. They did not, however, aſſign him the direction of any department, and introduced him merely (as ſubſequent events have ſhewn) to cover their tranſactions under a popular name, and paſs them on the world as acts in which he had taken part. Maleſherbes accepted their overtures merely to ſatisfy the deſire he felt to reveal ſome uſeful truths; but it was not for that purpoſe that they had invited him to their councils. Thoſe who preſided at them took umbrage at his firſt efforts to call their attention to the voice of truth and wiſdom; and ſucceeded ſo well in their oppoſition, that he was reduced to the neceſſity of delivering in writing the counſel which he wiſhed to offer. Such was the origin of two treatiſes relative to the calamities of France, and the means of repairing them. He tranſmitted theſe treatiſes to the king, who never read them; nor was he ever able to obtain a private audience although a miniſter of ſtate.

Such is the account of his laſt conduct in office which is given by his friends; and as we have not read his treatiſes on the calamities of France, we have no right to controvert it. From his known principles, however, we are intitled to conclude, that his plans of reformation were ſimilar to thoſe of Neckar, the offſpring rather of a head teeming with viſionary theories, than of the enlightened mind of a practical ſtateſman, or the corrupt heart of a Jacobin conſpirator.

Perceiving the inutility of his endeavours, diſguſted with what he thought the repeated errors of the government, and deprived of every means of expoſing them, or preventing their fatal effects; after frequent ſolicitations, he at length obtained leave to retire. He repaired to his eſtate at Maleſherbes, and from that moment entirely devoted his time to thoſe occupations that had ever formed the chief pleaſure of his life. He paſſed the evenings and a great part of the night in reading and ſtudy.

In this tranquil ſtate he was paſſing the evening of his days amidſt his woods and fields, when the horrors of the Revolution brought him again to Paris. During the whole of its progreſs, he had his eyes conſtantly fixed on his unhappy ſovereign, and, ſubduing his natural fondneſs of retirement, went regularly to court every Sunday, to give him proofs of his reſpect and attachment. He impoſed it as a duty on himſelf to give the miniſters regular information of the deſigns of the regicide faction [*]; and when it was determined to bring the king to trial, he voluntarily offered to be the defender of his maſter, in his memorable letter of the 11th of December 1792, that eternal monument of his loyalty and affection. His offer was accepted; and he pleaded the cauſe of the monarch with a ſtrength of argument that nothing could have reſiſted but the bloodthirſty minds of a den of Jacobins. "What Frenchman (ſays a valuable writer), what virtuous man, of any country, can ever forget that affecting ſcene, when the reſpectable old man, penetrating, for the firſt time, into the priſon of the Temple, melted into tears, on finding himſelf preſſed in the arms of his king; and that ſtill more affecting ſcene, when, entruſted with the moſt agonizing commiſſion that a ſubject could poſſibly have to his ſovereign, he threw himſelf at the feet of the innocent victim, while, ſuffocated with his ſobs, his voice, till re-animated by the courage of the virtuous Louis, was inadequate to announce the fatal ſentence of death*.

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[*] *Bertrand's Memoirs*, vol iii. chap. 31.

Having diſcharged this painful and hazardous duty he once more returned to his country reſidence, and reſumed his tranquil courſe of life. But this tranquillity was of ſhort duration. About a twelvemonth afterwards, in the month of December 1793, three worthy members of the Revolutionary Committee of Paris came to reſide with him, his ſon-in-law, and his daughter, and apprehended the two latter as criminals. Left alone with his grandchildren, Maleſherbes endeavoured to conſole the reſt of his unfortunate family with the hopes which he himſelf was far from entertaining, when, the next day, the new formed guards arrived to apprehend him, and the whole of his family, even the youngeſt infants. This circumſtance ſpread a general conſternation throughout the whole department; for there was hardly a man in France, a few ex-jeſuits excepted, who did not revere the mild virtues of the laſt friend of the unfortunate king.

In this calamity Maleſherbes preſerved the undiſturbed equanimity of virtue. His affability and good humour never forſook him, and his converſation was as uſual; ſo that to have beheld him (without noticing his wretched guards), it ſeemed that he was travelling for his pleaſure with his neighbours and friends. He was conducted the ſame night to the priſon of the Madelonette with his grandſon Louis Lepelletier, at the ſame time that his other grandchildren were ſeparated into different priſons. This ſeparation proving extremely afflicting to him, he earneſtly ſolicited againſt it; and at length, on his repeated entreaties, they all met together once more at Port Libre. They remained there but a ſhort period. The ſon-in-law of Maleſherbes, the virtuous Lepelletier Raſambo, the firſt of them who was arreſted, was ordered into another priſon, and ſacrificed a few days after. Maleſherbes himſelf, his daughter, his grand-daughter, and her huſband, were ſoon after all brought to the guillotine. They approached it with fortitude and ſerenity. It was then that his daughter addreſſed theſe pathetic words to Mademoiſelle Sombreuil, who had ſaved the life of her own father on the 2d of September: "You have had the exalted honour to preſerve *your* father—I have, at leaſt, the conſolation to die with *mine*."

Maleſherbes, ſtill the ſame, even to his laſt moments exhibited to his relations an example of fortitude. He converſed with the perſons that were near him without beſtowing the leaſt attention on the brutalities of the wretches who tied his hands. As he was leaving the priſon to aſcend the fatal cart, he ſtumbled againſt a ſtone, and made a falſe ſtep. "See (ſaid he ſmiling), how bad an omen! A Roman in my ſituation would have been ſent back again." He paſſed through Paris, aſcended the ſcaffold, and ſubmitted to death with the ſame unſhaken courage. He died at the age of 72 years, 4 months, and 15 days. He had only two daughters, and the ſon of one of them alone remains to ſucceed. From this account of Maleſherbes's behaviour at his laſt moments, we are inclined to believe that his intentions were better than ſome parts of his practical conduct; and we know, that having diſpelled the vain illuſions of philoſophiſm, he acknowledged his paſt errors; exclaiming, in the accents of grief, "That falſe philoſophy (to which I confeſs I was myſelf a dupe) has plunged us into the gulph of deſtruction, and, by an inconceivable magic, has faſcinated the eyes of the nation, and made us ſacrifice reality to a mere phantom. For the ſimple words *political liberty*, France has loſt that *ſocial freedom* which ſhe poſſeſſed in every reſpect, in a higher degree, than any other nation! How truly great did the king appear in his laſt moments! All their efforts to degrade him were vain; his unſhaken virtue triumphed over their wickedneſs. It is true, then, that religion alone transfuſes ſufficient courage into the mind of man, to enable him to ſupport, with ſo much dignity, ſuch dreadful trials."†

MALGUZZARY, in the language of Bengal, *payment* of revenue; the *revenue* itſelf.

MALPHAGHINO (John), otherwiſe called John de Ravenna, from the place of his birth, was born in the year 1352, of a family diſtinguiſhed neither by riches nor nobility. His father, however, committed him to the care of Donatus the grammarian, an intimate friend of Petrarch, who at that time taught the Latin tongue with great applauſe at Venice. Donatus thought he diſcovered ſuch happy diſpoſitions in young Malphaghino, that he recommended him to Petrarch, not only as an excellent aſſiſtant to facilitate his labours, by reading or tranſcribing for him, but as a youth of the moſt promiſing talents, and worthy of being formed under the inſpection of the greateſt man of the fourteenth century.

It appears from ſome of Petrarch's letters, for it is from theſe chiefly we can obtain information reſpecting John de Ravenna, that he fully anſwered the expectations formed of him; and that he even gained the favour and affection of his patron ſo much, that he loved him and treated him as if he had been his own ſon. In a letter to John de Certaldo (A), Petrarch highly extols him, not only for his genius and talents, but alſo for his prudent and virtuous conduct. "He poſſeſſes (ſays he) what is very rare in our times, a great turn for poetry, and a noble deſire to become acquainted with every uſeful and ornamental part of knowledge. He is favoured by the Muſes, and already attempts verſes of his own; from which one can foretel, that, if his life be ſpared, and if he goes on as hitherto, ſomething great may be expected from him."

Not long, however, after this panegyric was written, young Malphaghino conceived an inſuperable deſire to ſee the world; and, notwithſtanding all Petrarch's remonſtrances, perſiſted in his reſolution of quitting him.

* *Clery's Journal*, p. 158—196.

† *Bertrand's Memoire*, chap. 40.

(A) Better known under the name of *Boccaccio* or *Boccace*. Certaldo was the place of his birth.

Petrarch's paternal care and regard for his pupil appear, on this occaſion, in the moſt favourable light, as may be ſeen in his letters to Donatus; and his whole behaviour, though the young man inſiſted on leaving him, without aſſigning a ſufficient reaſon for his precipitate and ungrateful conduct, does as much honour to his head as to his heart.

The precipitation with which John de Ravenna carried his plan into execution was not likely to make it anſwer his expectations. He departed without taking with him letters of recommendation which Petrarch offered him to his friends. He, however, purſued his journey over the Appenines, amidſt continual rain, giving out that he had been diſmiſſed by Petrarch; but, though he experienced from many a compaſſion to which he was not entitled by his conduct, he now began to awaken from his dream. He proceeded therefore to Piſa, in order to procure a veſſel to carry him back towards Pavia; but being diſappointed, while his money waſted as much as his patience decreaſed, he ſuddenly reſolved to travel back acroſs the Appenines. When he deſcended into the Ligurian plains, he attempted to wade through a river in the diſtrict of Parma, which was much ſwelled by the rains; and being carried by the force of the ſtream into a whirpool, he would have loſt his life, had he not been ſaved by ſome people who were accidentally paſſing that way. After eſcaping this danger, he arrived, pennyleſs and famiſhed, at the houſe of his former patron, who happened then not to be at home; but he was received and kindly entertained by his ſervants till their maſter returned.

Petrarch, by his intreaties and paternal admonitions, retained the young man at his houſe for about a year, and prevented him from engaging in any more romantic adventures; but, at the end of that period, his deſire for rambling again returned; and as Petrarch found that all attempts to check him would be fruitleſs, he gave him letters of recommendation to two of his friends, Hugo de St Severino and Franciſcus Brunus, at Rome. To the former of theſe, Petrarch ſays, "This youth of rare talents, but ſtill a youth, after propoſing to himſelf various plans, has at length embraced the nobleſt; and as he once travelled, he is now deſirous of doing ſo again, in order to gratify his thirſt of knowledge. He has, in particular, a ſtrong inclination for the Greek language; and entertains a wiſh which Cato firſt conceived in his old age. This wiſh I have endeavoured for ſome years to ſubdue; ſometimes by intreaties, at other times by admonition; ſometimes by repreſenting how much he is ſtill deficient in the Roman language; and ſometimes by laying before him the difficulties which muſt attend him in his journey, eſpecially as he once before left me, and by want was obliged to return. As long as that unfortunate excurſion was freſh in his memory he remained quiet, and gave me hopes that his reſtleſs ſpirit could be overcome and reſtrained. But now, ſince the remembrance of his misfortunes is almoſt obliterated, he again ſighs after the world; and can be retained neither by force nor perſuaſion. Excited by a deſire which betrays more ardour than prudence, he is reſolved to leave his country, friends, and relations, his aged father, and me whom he loved as a father, and whoſe company he preferred to a reſidence at home, and to haſten to you whom he knows only by name. This precipitation even has an appearance of prudence. The young man firſt wiſhed to viſit Conſtantinople; but when I told him that Greece, at preſent, is as poor as it was formerly rich in learning, he gave credit to my aſſertion, and at any rate altered his plan, which he could not carry into execution. He is now deſirous of traverſing Calabria, and the whole coaſt of Italy, diſtinguiſhed formerly by the name of Magna Græcia, becauſe I once told him that there were in that quarter ſeveral men well ſkilled in the Greek language, particularly a monk, Barlaam, and one Leo, or Leontius, with whom I was intimately acquainted, and of whom the firſt had been ſome time my ſcholar. In conſequence of this propoſal, he begged me to give him a recommendatory letter to you, as you have conſiderable influence in that part of the country. This requeſt I granted, in hopes that the young man, by his genius and talents, will afford you ſatisfaction equal to the ſervice which you may render to him." In his letter to Brunus, Petrarch expreſſes himſelf as follows: "He is a young man who wiſhes to ſee the world as I formerly did; but I never reflect on it without horror. He is deſirous of ſeeing Rome; and this deſire I cannot condemn, as I myſelf have ſo often viſited that city, and could ſtill reviſit it with pleaſure. I ſuſpect, however, that he will venture on a more extenſive ocean, and that he imagines to find a fortune where he will, perhaps, meet with a ſhipwreck. At any rate, he is deſirous he ſays, of putting his fortune to a trial. I wiſh it may be favourable; ſhould it be adverſe, he is ſtill at liberty to return to my peaceful, though ſmall, haven; for I hang out a light, during the day as well as the night, to guide thoſe who quit me through youthful folly, and to enable them to find their way back. The ardour by which he is impelled muſt not be aſcribed ſo much to him as to his age, and is in itſelf commendable. If I am not much deceived, the young man loves me and virtue in general. He is unſteady, but modeſt; and deſerves that all good men ſhould contribute to his proſperity as far as they can."

From the letters of Petrarch, there is reaſon to believe, that John de Ravenna lived with him only about three years in all; and that he had not attained to the full age of manhood when he left him. It appears alſo, for this circumſtance is very obſcure, that after he quitted him, he wandered about a conſiderable time before he was ſo fortunate as to meet with a protector and patron, at whoſe houſe, as he wrote to Petrarch, he at laſt found a permanent aſylum. How long he remained with his patron, whom ſome believe to have been Cardinal Philip, and what happened to him till the death of Petrarch in 1374, and for ſome years after, is unknown. The literary monuments of the fourteenth and fifteenth centuries ſay nothing farther of him till his appearance at Padua; where, according to the teſtimony of Sicco (b), one of the moſt celebrated of his ſcholars,

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(b) Adoleſcens tum ego poetas, et inſtituta Tullii audiebam. Legebat tunc hac in civitate Padua, literarum nutrice, *Johannes Ravennas* vir et ſanctimonia morum, et ſtudio iſto excellens, atque ſi poteſt ſine invidia, dici ceteris, qui magiſtri artis hujus in terra Italia uſquam degerent et doctiſſimi haberentur, quantum recordari videor,

he not only taught the Roman Eloquence, but alſo the ſcience of moral philoſophy, with ſuch ſucceſs and applauſe, and improved his ſcholars ſo much by his life and example, that, according to univerſal opinion, he far excelled all the profeſſors of thoſe ſciences who had ever before appeared. That he was here of conſiderable ſervice in reviving the ſtudy of the Latin language, and of the works of the ancient Romans, was acknowledged by all his ſcholars, and is confirmed by the following teſtimony of Blondus (c).

“ About the ſame period, Ravenna produced that learned grammarian and rhetorician Johannes, of whom Leonardus Aretinus uſed to ſay, that he firſt introduced into Italy, after a long period of barbariſm, the ſtudy of the Latin language and eloquence, now ſo flouriſhing; a circumſtance which deſerves to be enlarged on in the preſent work. Thoſe well acquainted with Roman literature know, that after the periods of Ambroſe, Jerom, and Auguſtine, there were none, or very few, who wrote with any elegance, unleſs we add to theſe good writers, St Gregory, the venerable Bede, and St Bernard. Francis Petrarch was the firſt who, with much genius, and ſtill greater care, recalled from the duſt the true art of poetry and of eloquence. He did not attain to the flowers of Ciceronian eloquence, with which many are adorned in the preſent century; but this was owing rather to a want of books than of talents. Though he boaſted of having found at Vercelli Cicero's letters to Lentulus, he was unacquainted with the books of that great Roman *De Oratore*, Quintilian's Inſtitutes, the *Orator*, the *Brutus*, and other writings of Cicero. John de Ravenna was known to Petrarch both in his youth and in his old age. He was not more converſant with the ancients than Petrarch; and, as far as I know, left no works behind him. By his excellent genius, however, and, as Leonardus Aretinus ſays, by the particular diſpenſation of God, he was the preceptor of this Leonardus, of Petrus Paulus Vergerius, of Annebonus de Padua, of Robert Roſſi, of James Angeli of Florence, of Poggius and Guarino of Verona, of Victorinus, Sicco, and other men of leſs note, whom he incited to the ſtudy of better knowledge, and to imitate Cicero, if he could not form them or inſtruct them completely.

“ About the ſame time, Manuel Chryſoloras, a man as virtuous as learned, came from Conſtantinople to Italy, and inſtructed in the Greek language, partly at Venice and partly at Florence and Rome, all the before mentioned ſcholars of John de Ravenna. After he had continued this inſtruction for ſome years, thoſe unacquainted with the Greek language, and the ancient Greek writers, were conſidered in Italy as more ignorant than thoſe unacquainted with the Latin. A great many young men and youths were inflamed with an enthuſiaſtic deſire for the works of the ancient Greeks and Romans. At the time of the council of Conſtance, in the beginning of the fifteenth century, many of my countrymen endeavoured, by ſearching the neighbouring cities and convents, to diſcover ſome of the Roman manuſcripts which had been loſt. Poggius firſt diſcovered a complete copy of Quintilian, which was ſoon followed by the letters of Cicero to Atticus. As our youth applied to the ſtudy of theſe works with the utmoſt diligence, that celebrated grammarian and rhetorician Caſparinus de Bergamo, opened a ſchool at Venice, ſuperior to the former, and in which young perſons were encouraged to ſtudy the ancient languages and writers. About the ſame time flouriſhed Petrus Paulus Vergerus, Leonardus Aretinus, Robert Roſſi, James Angeli, Poggius, and Nicolaus de Medici, whom Aretin had long inſtructed. Guarinus alſo had begun to inſtruct many at Venice, and Victorinus at Mantua, when Philip III. Duke of Milan, recalled Caſparinus as his ſubject, from Venice to Padua and Milan. The increaſing ſtudy of ancient literature was much promoted by Gerard Landriano biſhop of Lodi, diſcovering under ſome ruins an old copy of Cicero, written in characters ſcarcely legible, which, among other rhetorical writings of that great Roman, contained the whole books *De Oratore*, with his *Brutus* and *Orator*. This ſaved Caſparinus the trouble of ſupplying the books of Cicero *De Oratore*, as he had attempted to ſupply the works of Quintilian. As no one was found in all Milan who could read this old manuſcript of Cicero, an ingenious young man of Verona, named Caſmus, was ſo fortunate as firſt to tranſcribe the books *De Oratore*, and to fill all Italy with copies of a work which was univerſally ſought for with the utmoſt avidity. I myſelf, in my youth, when I went to Milan on the buſineſs of my native city, tranſcribed, with as much ardour as ſpeed, the *Brutus* of Cicero, and ſent copies of my tranſcription to Guarinus at Verona, and to Leonard Juſtiniani at Venice; by which means this work was ſoon diſperſed all over Italy. By theſe new works eloquence acquired new fire; and hence it happens, that in our age people ſpeak and write better than in the time of Petrarch. The ſtudy of the Greek language, beſides the abundance of new and uſeful knowledge which it diſcloſed, was attended with this great advantage, that many attempted to tranſlate Greek works into Latin, and thereby improved their ſtyle much more than they could have done without that practice. After this period, ſchools for teaching the ancient languages increaſed in Italy, and flouriſhed more and more. Moſt cities had ſchools of this kind; and it gives one pleaſure to obſerve, that the ſcholars excelled their maſters, not only when they left them, but even while they were under their tuition. Of the ſcholars of John de Ravenna, two of the oldeſt, Guarinus and Victorinus, the former at Venice, and the latter at Mantua, Verona, Florence, and Ferrara, inſtructed an immenſe number of pupils; and among theſe, the Princes of Ferrara and Mantua. George of Trebiſonde, when he lectured at Rome, had for his auditors, beſides Italians, many French, Spaniards, and Germans, among whom ſometimes there were men of rank and eminence. Franciſcus

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omnium judicio præferendus. Hoc namque a præceptore non eloquentia modo, quam ex ordine legerit, ſed mores etiam, ac quædam bene honeſteque vivendi ratio cum doctrina tum exemplis diſcebatur.—*Sicco Polentonus*, Ap. Mehus, l. c. p. 139.

(c) Blondi Flavii Forlivienſis Italia illuſtrata. Bas. 1559. fol. p. 346.

cus Philelphus, who had been taught at Conſtantinople by Chryſoloras himſelf, inſtructed a great many young men and youths in the Greek and Latin languages at Venice, Florence, Siena, Bologna, and, laſt of all, at Milan." In the above quotation, the ſhare which John de Ravenna had in reviſing and diffuſing a knowledge, not only of the Roman, but alſo of the Grecian literature, is ſo clearly repreſented, that no farther teſtimony is neceſſary to eſtabliſh his claim to celebrity.

After John de Ravenna had taught at Padua, he removed for the like purpoſe to Florence; where, as appears, he inſtructed young people for ſome time, without being expreſsly invited by the government, and without being publicly paid for his labours. In the beginning of his reſidence at Florence, he ſeems to have been recommended by Colucius to the learned Charles de Malateſta. "There lives here at preſent (ſays Colucius, in one of his letters) a teacher of great merit, John de Ravenna.—He is (continues he) of mature age; irreproachable in his manners, and ſo diſpoſed in general, that if you receive him, as I hope and wiſh, among the number of your intimate friends, you will find him an agreeable and incomparable aſſiſtant to you in your labours and ſtudies. What can be more deſirable to you than to poſſeſs a man who will lucubrate and labour for you? and who, in a ſhort time, can communicate to you what you could not obtain by your own exertions without great difficulty. I do not know whether you will find his like in all Italy: and I therefore wiſh, that, if you confide in my judgment, you will receive John de Ravenna in the room of your late learned friend James de Alegretti." It is not known whether John de Ravenna went to reſide with Malateſta or not. It is, however, certain, that the former, in 1397 (the ſame year in which Manuel Chryſoloras came to Florence), was invited thither by the magiſtrates of that city, with the promiſe of an annual ſalary, to inſtruct young people in the Roman language and eloquence: that John de Ravenna, at the period when he entered into this honourable engagement, was 45 years of age; and that the ſcholars of John de Ravenna were, at the ſame time, ſcholars of Chryſoloras. Saluratus Colucius, in all probability, was the cauſe of this invitation, as he was acquainted with the ſervices of John de Ravenna, and knew how to appreciate them. "We know (ſays he, in one of his letters to John de Ravenna), and all who reſpect you know alſo, that none of the moderns, or even ancients, approached ſo near to Cicero as you; and that to the moſt wonderful beauty and powers of ſpeech, you join the deepeſt knowledge." John de Ravenna, like Chryſoloras, and moſt of the teachers of the Greek and Roman languages in the beginning of the fifteenth century, was, no doubt, engaged at firſt only for a few years; when theſe were elapſed, the engagement was renewed, perhaps for the laſt time, in 1412, and he was bound, beſides teaching the Roman eloquence, to read publicly, and explain in the cathedral, on feſtivals, the poems of Dante. John de Ravenna did not long ſurvive the above renewal of his engagement: for an anonymous writer, who, in 1420, titled *A Guide to Letter-writing, according to the Principles of John de Ravenna*," ſpeaks of his preceptor as of a man not then in exiſtence.

MALT. See Brewing (*Encycl.*), where a full account is given of Sir Robert Murray's method of malt-making, together with ſome valuable obſervations on malt by Mr Richardſon of Hull. In a late edition of this latter gentleman's *Theoretic Hints on Brewing*, we are told, that Mr Edward Rigby of Norwich is of opinion, that the mere exſiccation of corn is not the only object obtainable by drying it on the kiln, but that ſome portion of the ſaccharum of malt is the effect of that proceſs. "The operation of kiln drying the malt (ſays Mr Rigby) is as follows:—The grain is ſpread thick upon a floor made of flat bricks (*tiles*), or iron plates, which are full of perforations; immediately under this floor is the oven or furnace, in which is a large fire made of *coaks*, cinders, or, in ſome places, billet wood; a current of air, at the mouth of the furnace, keeps up the combuſtion of the coaks, and the air which is phlogiſticated by their burning, and which, in a common fire place, riſes up the chimney, paſſes, in this inſtance, through the apertures in the floor, and penetrates the whole ſtratum of malt before it can paſs into the external air. Under theſe circumſtances, it is evident, that the interſtices of the malt muſt be filled with phlogiſtic air: and as the grain uſually remains in this ſituation about two days, it is obvious, that if it have the power of abſorbing phlogiſton, it certainly muſt do it when ſo long in contact with it. And that the malt does really imbibe ſome of this principle, is not only probable on the general ground of the truth of the preceding theory, but, I believe, it will be found, that the phlogiſticated air which riſes from the burning ſubſtances underneath, is corrected in paſſing through the malt; for without its being meliorated by this or ſome other cauſe, it is evident that the air in the kiln-chamber, more eſpecially the lower ſtrata of it, muſt be noxious, and probably even ſo much ſo as to be unfit for reſpiration and combuſtion. But ſo far from this being the caſe, I am informed, that workmen will lie and ſleep many hours on the malt in this ſituation without ſuffering any inconvenience. And after mentioning this, it is ſcarcely neceſſary to add, that I find alſo, by experiment, that a candle will burn perfectly well in the air which is immediately on the ſurface of the malt.

"Were heat alone ſufficient for the purpoſe of completing the operation of malting, it certainly might be applied in a much more cheap way than is at preſent done; for the floor on which the grain is laid might, unqueſtionably, be heated equally without there being perforations in it, as with them. In which caſe, one kind of fuel would be as good as another; and, conſequently, the preſent expence of previouſly burning the coals, to convert them into coaks or cinders, might be ſaved.

"But, admitting that the application of phlogiſton to the malt, as well as heat, is requiſite in this operation, the neceſſity of theſe perforations becomes evident, and alſo the propriety of previouſly burning the coals in ſuch a way, that all the water, and thoſe other heterogeneous particles which compoſe ſmoke and ſoot, may be diſſipated; for theſe, merely as ſuch, would obviouſly contribute little to the phlogiſtication of the malt, and would evidently impart ſome offenſive flavour, if not ſome obnoxious quality to it.

"Reaſoning from the above premiſes (Mr Rigby concludes), it would ſeem, that as all the farinaceous parts of the barley are ſeldom diſſolved in brewing, and the grains which are left have uſually the diſpoſition to become ſour, thereby manifeſting ſome of the acid principle to be ſtill exiſting in them, it is not improbable but ſome further ſaccharine matter might be obtained from the grain by another expoſure to phlogiſticated air, or, in other words, by being once more laid on the kiln."

This is indeed ſo far from being improbable, that we think it muſt infallibly be the caſe. Sugar, it is well known, conſiſts of oxygen, hydrogen, and carbon (ſee CHEMISTRY in this *Supplement*, nº 466.); but from the diſpoſition of the grains to become ſour, it is plain, that after the proceſs of brewing they ſtill retain much oxygen; and the azotic gas, which is here called phlogiſticated air, there is every reaſon to believe contains both hydrogen and carbon. Theſe, therefore, uniting with the oxygen of the grains, muſt make an addition to the ſaccharine matter. This has, indeed, been found to be the fact by Mr Richardſon, who, in conſequence of Mr Rigby's ſuggeſtion, was induced to brew a ſmall brewing of malt, of ten quarters only, and ſtopping the proceſs when, according to his general practice, one extract was ſtill due, he ordered the grains to be laid upon one of his malt-kilns, and cinders to be applied the ſame as for drying of malt. This was continued for two days and a half, when the grains, being perfectly dried, were put into ſacks, and, when cold, returned again into the maſh-tun. The event, in ſome meaſure, juſtified Mr Rigby's expectation; for the produce of fermentable matter was conſiderably more than he had reaſon to conclude would have been the caſe, had the extract been made in immediate ſucceſſion, as it would have been in the ordinary courſe of his practice. He attempts, indeed, to account for it in a way very different from ours; but though we have the higheſt confidence in Mr Richardſon as an experienced brewer, we muſt ſometimes beg leave to think for ourſelves as chemiſts. Like a man of ſenſe, however, and a man of ſcience, he ſays, "I am ſo well ſatisfied with the event of this experiment, that I ſhall probably be inclined, on ſome future occaſion, to repeat it, in various ſtages of the proceſs. The fine lively froth on the ſurface of the wort, in the underback, added to its tranſparency and good flavour, are circumſtances which induce me to thank Mr Rigby for the hint, which, it is not improbable, may be applied to ſome uſeful purpoſe, in certain ſituations which ſometimes occur in the brewing trade."

MAMA KATING, a townſhip in Ulſter county, New York, W. of Montgomery and Wallkill, on Delaware river. It contains 1,763 inhabitants, including 232 electors, and 51 ſlaves.—*Morſe.*

MAMARONECK, a townſhip in Weſt-Cheſter county, New-York, containing 452 inhabitants, including 57 ſlaves. It is bounded ſoutherly by New Rochelle, and eaſterly by the Sound.—*ib.*

MAMARUMI, a place on the road from Guayaquil to Quito, in S. America, where there is a very beautiful caſcade. The rock from which the water precipitates itſelf, is nearly perpendicular, and 50 fathoms high; and on both ſides edged with lofty and ſpreading trees. The clearneſs of the water dazzles the ſight, which is delighted, at the ſame time, with the large volume of water formed in its fall; after which it continues its courſe in a bed, along a ſmall deſcent, and is croſſed over by a bridge.—*ib.*

MAMMALUKES, MAMALUCS, *Mameloucs*, or *Mamluks*, were a dynaſty that reigned for a conſiderable time in EGYPT, and of which ſome account has been given in that article *(Encycl.)*. A fuller account of them muſt, however, be acceptable to our readers, as, ſince the expedition of Buonaparte, they have attracted the attention of all Europe.

They were firſt introduced into Egypt, as we have already obſerved, by Saladine, who, when he had it in contemplation to beſiege Jeruſalem, very naturally endeavoured to collect the moſt forcible means to accompliſh ſo deſirable an end; and, in conſequence, obſerving that the ancient inhabitants of Egypt were, from their effeminate mode of education, and the quiet and tranquil habits of their lives, much fitter for thoſe occupations in which they delighted, namely, the arts, merchandize, and mechanics, than military tactics and military toil, he reſolved, as little as poſſible, to employ or depend upon them.

Antijacobin Review, nº 12. and *Brown's Travels.*

This reſolution ſtimulating him to procure a hardier race of ſoldiers, he therefore commiſſioned agents to treat with the Circaſſians, by the Lake of Mæotis, near Taurica Cherſoneſas, whence, about the year 1176, they purchaſed more than a thouſand ſlaves. Men inured to hardſhip, nurtured in the lap of toil and danger, and bred from their infancy to war, which was to them rather an inſtinct than a ſcience, as the continual incurſions of the Tartars rendered ſelf-defence, in their ſituation, abſolutely neceſſary.

Theſe ſlaves Saladine trained to military diſcipline, and, at the ſame time that he made them renounce Chriſtianity, had them inſtructed in the Mahometan religion; and although he prohibited them from marrying, he allowed them an unbounded licence with reſpect to deſultory gallantry. What progreſs they made in the doctrines of the Alcoran, whether the tenets of that ſacred volume effectually eradicated all their firſt principles, is uncertain; but it is certain, that in time they became excellent ſoldiers, and that the military glory of Saladine, which was feebly ſupported by the native Egyptians, expanded in the hands of the Mameloucs, who extended their conqueſts on every ſide, until, pervading the Holy Land, they entered in the plain of Aſkelon.

Theſe Mameloucs, who were continually adding to their numbers, in proceſs of time became naturalized to the country; and, as it has been obſerved, they excelled the Egyptians in ſtrength of body, in military diſcipline, in their ſkill in horſemanſhip, and in courage; ſo they, by the liberality of their generals, and the plunder of cities and provinces, alſo excelled them in wealth. In fact, their mode of education fitted them for the moſt dangerous and adventurous enterpriſes, and, from being the ſlaves, enabled them in time to become the maſters of even the Turks, by whom they had originally been purchaſed.

After the death of Saladine, who left the kingdom to his brother, they roſe to ſtill greater importance than they had acquired during his reign, and continued, if not abſolutely to govern, yet, like the Roman ſoldiers in the time of Pertinax, Alexander, and Valerian, to awe the monarch.

This influence continued through the reigns of five ſucceſſive Caliphs, until that of Melachſala, the laſt of the poſterity of Saladine, who being at war with the Arriſtians, and at the ſame time, wiſhing to repreſs the enormous power of the Mameloucs, purchaſed ſlaves from all the ſurrounding countries, whom, in imitation of his anceſtor, he armed and appointed to defend his dominions. The event of this meaſure was exactly what might have been expected. Melachſala was, in conſequence of a conſpiracy betwixt his new and his old ſoldiers, ſlain; and Turquemenus, the leader of this mutiny and rebellion, hailed by the title of Great Sultan of Egypt. With him began the government of the Mameloucs, about the year 1250; which had the next year gathered ſuch ſtrength, that it was thought neceſſary, in order to repreſs thoſe exuberances to which new formed governments are liable, and bring it nearer to a ſyſtem, to cauſe the following articles, in the form of a charter, to be ſubſcribed to by their principal leaders, as an act of the whole people:—"1ſt, That the Sultan ſhould be choſen from the body of Mameloucs: 2dly, That none ſhould be admitted into the order that were by birth either Jews or Turks, but only Chriſtian captives; 3dly, That the native Egyptians ſhould not be permitted to uſe, or have, any weapons, except the inſtruments of agriculture."

Turquemenus, as is frequently the practice with thoſe that experience a ſudden elevation, endeavoured to kick down the ladder by which he had been raiſed; or, in other words, his carriage was ſo haughty and diſdainful to his former companions, that he was by them, or rather by one of them named Clotho, ſuddenly ſlain; for which the murderer was rewarded with his ſceptre. After him ſucceeded a long race of princes, many of whom were as eminent for their talents as for their valour; among whom, the name of Caitbeius has been tranſmitted to us as that of the greateſt ſtateſman and general of his age; but, as every one who conſiders the *materials* of which the government was compoſed, muſt rather wonder that it exiſted ſo long, than that it ſhould, through almoſt the whole courſe of its operation, be expoſed to all the various evils and diſtreſſes ariſing from a long train of ſedition and tumults, ſo he muſt lament that it ſhould expire in the reign of one of their wiſeſt and beſt monarchs: yet it is ſome conſolation to reflect, that Campſon, the laſt Sultan of the Mameloucs, was not *murdered by his own ſubjects*, but having for many years governed the kingdoms of Egypt, Judea, and Syria, in a manner that has excited the praiſe of the hiſtoric pen, he, oppreſſed with age and diſeaſe, and encumbered with his armour, ſunk upon the field of battle, and, with his laſt breath, yielded the victory to the fortunate Selim.

With this monarch, who expired January 20, 1516, ended the government of the Mameloucs, after it had continued 276 years; for although an attempt was made by Tomumby to get himſelf declared Sultan, in which attempt he actually ſucceeded ſo far as to be inveſted with the title, yet he was ſoon after defeated by the victorious Selim. He was then forſaken by his troops, taken and executed; while the Mameloucs, broken and diſperſed, it was the policy of Selim to rally, and, by offers too tempting to be by them refuſed, engage in his ſervice. The uſe of theſe ſoldiers ſoon became ſufficiently apparent to the Turkiſh Emperors, to ſtimulate them to augment their number, enlarge their ſphere of action, and combine them cloſer to the ſtate, by the allowance of ſtill greater privileges and advantages than they had before enjoyed.

The Beys were ordained to be choſen from among them; and the Paſha, or chief governor for the Porte, was to ſhare his power with thoſe Beys, and even to continue in office no longer than ſhould be agreeable to their collective will. At firſt the power of the Paſha was very extenſive; but, by the intrigues and ambition of the Beys, it has been reduced almoſt to a cypher. It was rather of a civil than military nature. He was always preſident of the Divan, which was held in the caſtle where he reſided. But that council now commonly meets in the palace of one of the chief Beys, except when a firman or mandate is received from Conſtantinople, when the Beys are ſummoned to the caſtle, to hear the commands of the Porte. The few who attend, as ſoon as the reading is finiſhed anſwer, as is uſual, "*Eſmana wa taana*" "We have heard, and we obey." On leaving the caſtle, their general voice is "*Eſmana wa awſina*," We have heard, and ſhall diſobey."

In the year 1791, Salah Aga, a ſlave of Murad Bey, was deputed from the government of Egypt to negociate their peace with the Porte. He carried preſents of horſes, rich ſtuffs, &c. A ſpontaneous tribute, which the Porte was in no condition to enforce, implied obligation on the part of the latter. He was well received, and afterwards was appointed *Waquil es Sultan*, agent or attorney to the Sultan in Cairo. It is probable, this office was given him to incline him to ſecond the efforts of the Court in diſuniting the Beys; but it was ineffectual. Theſe had formerly experienced the evils of diviſion, and now were united by common intereſt, grown rich, and well provided with ſlaves; ſo that no tribute has ſince that time found its way to Conſtantinople.

The Mameloucs remain, as they have ever been, military ſlaves, imported from Georgia, Circaſſia, and Mingrelia. A few have been priſoners, taken from the Auſtrians and Ruſſians, who have exchanged their religion for an eſtabliſhment. The Beys give general orders to their agents at Conſtantinople, to purchaſe a certain number every year; and many are brought to Egypt by private merchants on ſpeculation. When the ſupply proves inſufficient, or many have been expended, black ſlaves from the interior of Africa are ſubſtituted, and, if found docile, are armed and accoutred like the reſt.

Particular attention is paid to the education of theſe favoured ſlaves. They are inſtructed in every exerciſe of agility or ſtrength, and are, in general, diſtinguiſhed by the grace and beauty of their perſons. The gratitude of the diſciples is equal to the favour of their maſters, whom they never quit in the hour of danger. If they have a diſpoſition for learning, they are taught the uſe of letters, and ſome of them are excellent ſcribes; but the greater part neither can read nor write. A ſtriking example of which deficiency is obſervable in Murad Bey himſelf.

The inferior Mameloucs conſtantly appear in the military dreſs, and are commonly armed with a pair of piſtols, a ſabre, and a dagger. They wear a peculiar cap of a greeniſh hue, around which is wreathed a turban. The reſt of their dreſs reſembles that of other Mohamedan citizens, and is reſtricted to no particular colour; but another ſingularity is, their large drawers of thick Venetian cloth, of a crimſon colour, to which are attached their ſlippers of red leather. On horſeback

back they add to their arms a pair of large horſe piſtols, and the dubbus or battle axe. In battle, many of them wear an open helmet, and the ancient ring armour of interwoven links of ſteel, worn under part of their dreſs, and thus concealed. Theſe are dear; ſometimes coſting 500 piaſtres, or about L. 40. Some of them are made at Conſtantinople, others in Perſia. Their horſes are of the fineſt Arabian breed, and are often purchaſed at three or four purſes, L. 150 to L. 200 ſterling.

They have no pay, as they eat at a table in the houſe of their maſter the Bey, Caſhef, or other officer. Any military officer may purchaſe a ſlave, who becomes, *ipſo facto*, a Mamelouc. The name, from *malek*, to poſſeſs, implies merely a perſon who is the property of another. After a proper education, the candidate thus conſtituted a Mamelouc, receives a preſent of a horſe and arms from his maſter, together with a ſuit of clothes; which is renewed every year in the month Ramadan. The generoſity of their maſters, and rewards or extortions from others, afford them ſupplies of money, either for avarice or debauchery. Some of them, admitted to peculiar favour by the Beys, as chaſnadars, or purſe-bearers, &c. acquire great wealth. They are rather gay and thoughtleſs than inſolent, fond of ſhow, and unprincipled in their means of acquiring it. They ſeldom marry till they acquire ſome office.

Though born of Chriſtian parents, they ſeem highly ſatisfied with their condition, which they have been known to refuſe to exchange for freedom. The majority are regarded by the Arabs as little ſtrict in the principles or duties of Mohamediſm. It is worthy of remark, that though the Mameloucs, in general, be ſtrong and perſonable men, yet the few who marry very ſeldom have children. As the ſon, even of a Bey, is not honoured with any particular conſideration, the women, perhaps, procure abortions. Of eighteen Beys, with whoſe hiſtory Mr Browne was well acquainted, two only had any children living.

Hardy, capable of every fatigue, of undaunted courage, and eminent ſkill in horſemanſhip and the uſe of the ſabre, the Mameloucs may be regarded as by far the beſt troops in the Eaſt. But in a regular battle, conducted by manœuvres, and large or rapid movements, they are equally inferior to European troops.

Being diſtinguiſhed by favouritiſm or merit, the Mamelouc becomes a Caſhef, and in time a Bey. The chief cauſe of preference ariſes from political adherence to ſome powerful leader.

The government of Cairo, and Egypt, in general, is veſted in 24 Beys; each of whom is nominally choſen by the remaining 23, but, in fact, appointed by one of the moſt powerful. The Yenk-tchery, Aga, and ſeveral other officers, are enumerated among the 24 Beys.

Beſides being governors of certain diſtricts of Egypt, ſeveral of the Beys receive other dignities from the Porte: Such are the Shech el Bellad or governor of the city; the Defterdar, or accountant-general; the Emir el Hadj, or leader of the ſacred caravan; and the Emir es Said, or governor of the Upper Egypt. Theſe two laſt offices are annual. Theſe officers have alſo revenues allotted them by the Porte, ill defined, and liable to much abuſe.

Of the other Beys, each appoints all officers and governors within his diſtrict, putting into it ſome ſlave of his own, who is compelled to render an account of the receipts, of which a great part paſſes to ſupport the grandeur of his maſter. An opulent Bey may have from 600 to 1000 purſes annually; the revenue of Murad Bey more than doubles that ſum. The inferior Beys may have 300 purſes, or L. 15,000.

Every Bey ſits in judgment on caſes of equity. Theſe perſonages are very obſervant of their reſpective juriſdictions; and no Bey will impriſon a man liberated by another. Though ſometimes too impetuous, they nevertheleſs diſplay great acuteneſs and knowledge of characters. This government, at leaſt, poſſeſſes every advantage of publicity, as every Bey is a magiſtrate.

MAN, has been conſidered in a great number of particulars under the title MAN (*Encycl.*); but a reference was made from that article to the article *VARIETIES of the Human Species*, which was, after all, omitted entirely.

Perhaps enough has been ſaid on the varieties of the human ſpecies in the articles COMPLEXION and NEGRO (*Encycl.*); but as infidel ignorance is perpetually pretending, that the diminutive Icelanders, the ugly Eſquimaux, the woolly-headed Negro, and the copper-coloured American, could not have deſcended from one original pair either of European complexion or of Hindoo ſymmetry—it may not be improper, in this place, to ſhew the weakneſs of this popular objection to the Moſaic hiſtory of the origin of man. This has been done in ſo ſatisfactory a manner by Profeſſor Blumenbach, that we have nothing to do but lay his obſervations before our readers, convinced, as we are, that they are intelligible to every capacity, and that they will carry conviction to all who are not the ſlaves of prejudice.

"Some late writers on natural hiſtory (ſays the Profeſſor) ſeem doubtful whether the numerous diſtinct races of men ought to be conſidered as mere varieties, which have ariſen from degeneration, or as ſo many ſpecies altogether different. The cauſe of this ſeems chiefly to be, that they took too narrow a view in their reſearches; ſelected, perhaps, two races the moſt different from each other poſſible, and, overlooking the intermediate races that formed the connecting links between them, compared theſe two together; or, they fixed their attention too much on man, without examining other ſpecies of animals, and comparing their varieties and degeneration with thoſe of the human ſpecies. The firſt fault is, when one, for example, places together a Senegal negro and an European Adonis, and at the ſame time forgets that there is not one of the bodily differences of theſe two beings, whether hair, colour, features, &c. which does not gradually run into the ſame thing of the other, by ſuch a variety of ſhades, that no phyſiologiſt or naturaliſt is able to eſtabliſh a certain boundary between thoſe gradations, and conſequently between the extremes themſelves.

Phil. Mag. vol. iii. p. 284.

"The ſecond fault is, when people reaſon as if man were the only organiſed being in nature, and conſider the varieties in his ſpecies to be ſtrange and problematical, without reflecting that all theſe varieties are not more ſtriking or more uncommon than thoſe with which ſo many thouſands of other ſpecies of organiſed beings degenerate, as it were, before our eyes."

As what we have ſaid under the articles COMPLEXION and NEGRO may be ſufficient to warn mankind againſt the firſt error, and at the ſame time to refute it, we haſten to refute the ſecond by our author's compariſon between the human race and that of ſwine.

" More reaſons (ſays he) than one have induced me to make choice of ſwine for this compariſon; but, in particular, becauſe they have a great ſimilarity, in many reſpects, to man: not, however, in the form of their entrails, as people formerly believed, and therefore ſtudied the anatomy of the human body purpoſely in ſwine; ſo that, even in the laſt century, a celebrated diſpute, which aroſe between the phyſicians of Heidelberg and thoſe of Durlach, reſpecting the poſition of the heart in man, was determined, in conſequence of orders from government, by inſpecting a ſow, to the great triumph of the party which really was in the wrong. Nor is it becauſe in the time of Galen, according to repeated aſſertions, human fleſh was ſaid to have a taſte perfectly ſimilar to that of ſwine; nor becauſe the fat, and the tanned hides of both, are very like to each other; but becauſe both, in regard to the economy of their bodily ſtructure, taken on the whole, ſhew unexpectedly, on the firſt view, as well as on cloſer examination, a very ſtriking ſimilitude.

" Both, for example, are domeſtic animals; both *omnivora;* both are diſperſed throughout all the four quarters of the world; and both conſequently are expoſed, in numerous ways, to the principal cauſes of degeneration ariſing from climate, mode of life, nouriſhment, &c.; both, for the ſame reaſon, are ſubject to many diſeaſes, and, what is particularly worthy of remark, to diſeaſes rarely found among other animals than men and ſwine, ſuch as the ſtone in the bladder; or to diſeaſes excluſively peculiar to theſe two, ſuch as the worms found in meaſled ſwine.

" Another reaſon (continues he) why I have made choice of ſwine for the preſent compariſon is, becauſe the degeneration and deſcent from the original race are far more certain in theſe animals, and can be better traced, than in the varieties of other domeſtic animals. For no naturaliſt, I believe, has carried his ſcepticiſm ſo far as to doubt the deſcent of the domeſtic ſwine from the wild boar; which is ſo much the more evident, as it is well known that wild pigs, when caught, may be eaſily rendered as tame and familiar as domeſtic ſwine: and the contrary alſo is the caſe; for if the latter by any accident get into the woods, they as readily become wild again; ſo that there are inſtances of ſuch animals being ſhot for wild ſwine; and it has not been till they were opened, and found caſtrated, that people were led to a diſcovery of their origin, and how, and at what time, they ran away. It is well aſcertained, that, before the diſcovery of America by the Spaniards, ſwine were unknown in that quarter of the world, and that they were afterwards carried thither from Europe. All the varieties, therefore, through which this animal has ſince degenerated, belong, with the original European race, to one and the ſame ſpecies; and ſince no bodily difference is found in the human race, as will preſently appear, either in regard to ſtature, colour, the form of the cranium &c. which is not obſerved in the ſame proportion among the ſwine race, while no one, on that account, ever doubts that all theſe different kinds are merely varieties that have ariſen from degeneration through the influence of climate, &c. this compariſon, it is to be hoped, will ſilence thoſe ſceptics who have thought proper, on account of theſe varieties in the human race, to admit more than one ſpecies.

" With regard to ſtature, the Patagonians, as is well known, have afforded the greateſt employment to anthropologiſts. The romantic tales, however, of the old travellers, who give to theſe inhabitants of the ſouthern extremity of America a ſtature of ten feet and more, are ſcarcely worth notice; and even the more modeſt relations of later Engliſh navigators, who make their height from ſix to ſeven feet, have been doubted by other travellers, who, on the ſame coaſt, ſought for ſuch children of Enoch in vain. But we ſhall admit every thing ſaid of the extraordinary ſize of theſe Patagonians by Byron, Wallis, and Carteret; the firſt of whom aſſigns to their chief, and ſeveral of his attendants, a height of not leſs than ſeven feet, as far as could be determined by the eye; the ſecond, who aſſerts that he actually meaſured them, gives to the greater part of them from 5 feet 10 inches to 6 feet; to ſome 6 feet 5 inches, and 6 feet 6; but to the talleſt, 6 feet 7 inches: and this account is confirmed by the laſt-mentioned of the above circumnavigators. Now, allowing this to be the caſe, it is not near ſuch an exceſs of ſtature as that obſerved in many parts of America among the ſwine, originally carried thither from Europe; and of theſe I ſhall mention in particular thoſe of Cuba, which are more than double the ſize of the original ſtock in Europe.

" The natives of Guinea, Madagaſcar, New Holland, New Guinea, &c. are black; many American tribes are reddiſh brown, and the Europeans are white. An equal difference is obſerved among ſwine in different countries. In Piedmont, for example, they are black. When I paſſed (ſays our author) through that country, during the great fair for ſwine at Salenge, I did not ſee a ſingle one of any other colour. In Bavaria, they are reddiſh brown; in Normandy, they are all white.

" Human hair is, indeed, ſomewhat different from ſwines briſtles; yet, in the preſent point of view, they may be compared with each other. Fair hair is ſoft, and of a ſilky texture; black hair is coarſer, and among ſeveral tribes, ſuch as the Abyſſinians, Negroes, and the inhabitants of New Holland, it is woolly, and moſt ſo among the Hottentots. In the like manner, among the white ſwine in Normandy, as I was aſſured by an incomparable obſerver, Sulzer of Ronneburg, the hair on the whole body is longer and ſofter than among other ſwine; and even the briſtles on the back are very little different, but lie flat, and are only longer than the hair on the other parts of the body. They cannot, therefore, be employed by the bruſh makers. The difference between the hair of the wild boar and the domeſtic ſwine, particularly in regard to the ſofter part between the ſtrong briſtles, is, as is well known, ſtill greater.

" The whole difference between the cranium of a Negro and that of an European, is not in the leaſt degree greater than that equally ſtriking difference which exiſts between the cranium of the wild boar and that of the domeſtic ſwine. Thoſe who have not obſerved this in the animals themſelves, need only to caſt their eye on the figure which Daubenton has given of both.

" I ſhall paſs over (ſays our author) leſs national varieties which may be found among ſwine as well as among men, and only mention, that I have been aſſured by Mr Sulzer, that the peculiarity of having the bone of the leg remarkably long, as is the caſe among the Hindoos, has been remarked with regard to the ſwine in Normandy. 'They ſtand very long on their hind legs (ſays he, in one of his letters); their back, therefore, is higheſt at the rump, forming a kind of inclined plane; and the head proceeds in the ſame direction, ſo that the ſnout is not far from the ground.' I ſhall here add, that the ſwine, in ſome countries, have degenerated into races which in ſingularity far exceed every thing that has been found ſtrange in bodily variety among the human race. Swine with ſolid hoofs were known to the ancients, and large herds of them are found in Hungary, Sweden, &c. In the like manner, the European Swine, firſt carried by the Spaniards, in 1509, to the iſland of Cuba, at that time celebrated for its pearl fiſhery, degenerated into a monſtrous race, with hoofs which were half a ſpan in length."

From theſe facts, our author concludes, that it is abſurd to allow the vaſt variety of ſwine to have deſcended from one original pair, and to contend that the varieties of men are ſo many diſtinct ſpecies.

MANALLIN, a townſhip in York county, Pennſylvania.—*Morse.*

MANCA, a town of Weſt-Florida, on the E. bank of the Miſſiſſippi, at the mouth of Hona Chitto river. —*ib.*

MANCENILLA, a large bay on the N. ſide of the iſland of St Domingo; about 4,000 fathoms long from W. to E. and 2,800 broad from N. to S. The S. E. part of the bay is very wide, and affords excellent anchorage, even for veſſels of the firſt ſize. In other parts it is too ſhallow. The river Maſſacre, which was the point of ſeparation of the French and Spaniſh colonies on the N. of the iſland, runs a N. courſe, towards its mouth N. W. and enters the eaſtern part of the bay. The bay of Mancenilla, though a very fine one, is not ſo uſeful as it might be, if its bottom were well known. There are ſeveral ſhallows in it, owing to the overflowings of the Maſſacre, which rolls into it, wood, ſand, and ſtones, in great quantities, ſo that it ſeems neceſſary to ſound the bay annually, after they are over. In general, it is prudent, on entering, to keep cloſer to the point of Ycaque, than to the S. ſide of the bay; becauſe the ſandy point has no rocks. The bottom of the bay is muddy. The river Maſſacre is, during a league, from 5 to 12 feet deep, and pretty wide; but its bed is often full of the wood which the current brings down. It ſwarms with fiſh; and here are found thoſe enormous mullets which are the pride of the table at Cape Francois. In the times of the floods, theſe fiſh are driven towards the bay, where negroes, well practiſed in the buſineſs, fiſh for them. Fiſhing in the bay is difficult enough, on account of the drifted wood; but the negroes are good divers, and are often obliged to go to the bottom and diſengage the ſeine; but when it gets near the beach, it is a ſingular and ſtriking ſpectacle, to ſee the negroes, the fiſh, and the alligators, all flouncing about in the water together. The negroes kill the alligators, knock out their teeth, and ſell them to make corals, the garniture of which ſerves to mark the degree of luxury or pride of thoſe who hang them to the necks of their children. The plenty of fiſh often attracts ſhips of war to this bay. The mouth of Maſſacre river lies in N. lat. 19° 44′, W. long. from Paris 74° 9′.—*ib.*

MANCHAC, a town on the Miſſiſſippi, two miles below the Indian town of Alabama. The banks of the river at Manchac, though frequently overflowed by the vernal inundations, are 50 feet perpendicular height above the ſurface of the water; and the river, at its loweſt ebb, is not leſs than 40 fathoms deep, and nearly a mile in width. The Spaniſh fortreſs on the point of land below the Ibberville, cloſe by the banks of the river, has a communication with Manchac, by a ſlender, narrow, wooden bridge, acroſs the channel of Ibberville, and not a bow-ſhot from the habitations of Manchac.—*ib.*

MANCHESTER, a ſmall fiſhing-town, ſituated on the ſea-coaſt between Cape Anne and Beverly, in Eſſex county, Maſſachuſetts. The fiſhery is carried on from this port chiefly in the veſſels, and for the account of the merchants in Boſton, and other places. The townſhip lies S. E. of Wenham, and 30 miles N. E. of Boſton. It was incorporated in 1645, and contains 965 inhabitants.—*ib.*

MANCHESTER, a poſt-town of Vermont, in Bennington county, on Battenkill. It is 22 miles N. by E. of Bennington, and 59 N. E. of Albany in New-York. This townſhip contains 1276 inhabitants. In the S. part of the town, in a hill a little W. of the Battenkill, is a deep ſtratum of friable calcareous earth, of the whiteneſs of chalk; and apparently compoſed of ſhells, which requires but little burning to produce good lime. —*ib.*

MANCHESTER, a townſhip in York county, Pennſylvania.—*ib.*

MANCHESTER, a ſmall town of Virginia, ſituated on the S. ſide of James river, oppoſite to Richmond, with which it is connected by a bridge. In 1781 this town ſuffered much during Arnold's deſtructive expedition. —*ib.*

MANCHESTER, a town of Nova-Scotia, 10 leagues N. W. of Cape Canſo. It contained 250 families in 1783.—*ib.*

MANCHESTER HOUSE, one of the Hudſon Bay Company's factories, lies 100 miles W. of Hudſon's Houſe, and 75 S. E. of Buckingham Houſe. It ſtands on the S. W. ſide of Saſkaſhawan river, in the N. W. part of N. America. N. lat. 53° 14′ 18″, W. long. 109° 20′. —*ib.*

MANCORA, a place on the road from Guayaquil to Truxilla, in Peru, ſituated on the ſea-coaſt. Through it, during winter, runs a rivulet of freſh water, to the great relief of the mules that travel this way. In ſummer, the little remaining in its channel is ſo brackiſh, as to be hardly tolerable.—*ib.*

MANDING, a large ſtate in the interior of Africa, of which the only ſatisfactory account that we have is by Mr Park, who, for ſeveral months, was hoſpitably entertained in Kamalia, one of its towns, ſituated in 12° 40′ N. Lat. and 6° 40′ W. Long. The government of Manding appeared to our author to be a ſort of republic, or rather an oligarchy. Every town is indeed governed by a chief magiſtrate called Manſa, which uſually ſignifies king; but the chief power of the ſtate, in the laſt reſort, is lodged in the aſſembly of theſe manſas (A). The caſe, however, is different in other countries, which are occupied by people who have emigrated from Manding; for in all the Mandingo ſtates near the Gambia, the government is monarchical, though the power of the ſovereign is by no means unlimited.

As Mr Park's route was confined to a tract of country, bounded nearly by the 12th and 15th parallels of latitude, the climate throughout the whole was nearly the ſame as that of Manding, and extremely hot: Yet, where the country aſcended into hills, he found it comparatively cool and pleaſant; though none of the diſtricts which he traverſed could be called mountainous. About the middle of June, the hot and ſultry atmoſphere is agitated by violent guſts of wind (called *tornadoes*), accompanied with thunder and rain. Theſe uſher in what is denominated *the rainy ſeaſon;* which continues until the month of November. During this time, the diurnal rains are very heavy; and the prevailing winds are from the ſouth-weſt. The termination of the rainy ſeaſon is likewiſe attended with violent tornadoes; after which the wind ſhifts to the north-eaſt, and continues to blow from that quarter during the reſt of the year.

When the wind ſets in from the north-eaſt, it produces a wonderful change in the face of the country. The graſs ſoon becomes dry and withered; the rivers ſubſide very rapidly, and many of the trees ſhed their leaves. About this period is commonly felt the *harmattan*, a dry and parching wind, blowing from the north-eaſt, and accompanied by a thick ſmoky haze; through which the ſun appears of a dull red colour. This wind, in paſſing over the great deſert of Sahara, acquires a very ſtrong attraction for humidity, and parches up every thing expoſed to its current. It is, however, reckoned very ſalutary, particularly to Europeans, who generally recover their health during its continuance. The truth of this our author experienced both at Kamalia and Piſania, when he had been brought to the very brink of the grave by ſickneſs.

Whenever the graſs is ſufficiently dry, the negroes ſet it on fire; but in Ludamar, and other Mooriſh countries, this practice is not allowed; for it is upon the withered ſtubble that the Moors feed their cattle until the return of the rains. The burning of the graſs in Manding exhibits a ſcene of terrific grandeur. "In the middle of the night (ſays Mr Park), I could ſee the plains and mountains, as far as my eye could reach, variegated with lines of fire; and the light reflected on the ſky, made the heavens appear in a blaze. In the day time, pillars of ſmoke were ſeen in every direction; while the birds of prey were obſerved hovering round the conflagration, and pouncing down upon the ſnakes, lizards, and other reptiles, which attempted to eſcape from the flames." This annual burning is ſoon followed by a freſh and ſweet verdure, and the country is thereby rendered more healthful and pleaſant.

Though many ſpecies of the edible roots, which grow in the Weſt India iſlands, are found in Africa, yet our traveller never ſaw, in any part of his journey, either the ſugar-cane, the coffee, or the cocoa-tree; nor could he learn, on inquiry, that they were known to the natives. The pine-apple, and the thouſand other delicious fruits which the induſtry of civilized man (improving the bounties of nature), has brought to ſo great perfection in the tropical climates of America, are here equally unknown. He obſerved, indeed, a few orange and banana trees, near the mouth of the Gambia; but whether they were indigenous, or were formerly planted there by ſome of the white traders, he could not poſitively learn.

Concerning property in the ſoil, it appeared to Mr Park, that the lands in native woods were conſidered as belonging to the king, or (where the government was not monarchical) to the ſtate. When any individual of free condition had the means of cultivating more land than he actually poſſeſſed, he applied to the chief man of the diſtrict, who allowed him an extenſion of territory, on condition of forfeiture if the lands were not brought into cultivation by a given period. The condition being fulfilled, the ſoil became veſted in the poſſeſſor; and, for aught that appeared, deſcended to his heirs.

The Mandingoes are a very gentle race of people; cheerful in their diſpoſitions, inquiſitive, credulous, ſimple, and fond of flattery. The men are commonly above the middle ſize, well ſhaped, ſtrong, and capable of enduring great labour; the women are good natured, ſprightly, and agreeable. The dreſs of both ſexes is compoſed of cotton cloth of their own manufacture; that of the men is a looſe frock, not unlike a ſurplice, with drawers which reach half way down the leg; and they wear ſandals on their feet, and white cotton caps on their heads. The women's dreſs conſiſts of two pieces of cloth, each of which is about ſix feet long and three broad; one of theſe they wrap round the waiſt, which, hanging down to the ancles, anſwers the purpoſe of a petticoat; the other is thrown negligently over the boſom and ſhoulders. Both men and women among the Mandingoes ſeem to have an invincible propenſity to commit depredations on the property of unprotected ſtrangers; whilſt ſuch is the good nature of theſe poor heathens, that they will readily ſympathiſe in the ſufferings, relieve the diſtreſſes, and contribute to the perſonal ſafety, of the very ſtrangers whom they are bent upon plundering.

Among the Mandingoes, the parental and filial affection is remarkably ſtrong between the mother and her child; but not ſo between the father and his children. This, as Mr Park obſerves, is eaſily accounted for. The ſyſtem of polygamy, while it weakens the father's attachment, by dividing it among the children of different wives, concentrates all the mother's jealous tenderneſs to one point, the protection of her own offſpring. He perceived, with great ſatisfaction too, that the maternal ſolicitude extended, not only to the growth and ſecurity of the perſon, but alſo, in a certain degree, to the improvement of the mind of the infant; for one of the

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(A) Mr Park, for the moſt part, writes with remarkable perſpicuity; but we are not ſure that here we have not miſtaken his meaning. He ſays, that the chief power of the ſtate is lodged in the aſſembly of that *whole body*; but we think, that by the whole body muſt be meant the body of *Manſas*, otherwiſe the government could not be called an oligarchy.

firſt leſſons, in which the Mandingo women inſtruct their children, is *the practice of truth.*

The Mandingo women ſuckle their children until they are able to walk of themſelves. Three years nurſing is not uncommon; and during this period, the huſband devotes his whole attention to his other wives. To this practice it is owing, that the family of each wife is ſeldom very numerous. Few women have more than five or ſix children. As ſoon as an infant is able to walk, it is permitted to run about with great freedom. The mother is not over ſolicitous to preſerve it from ſlight falls, and other trifling accidents. A little practice ſoon enables a child to take care of itſelf, and experience acts the part of a nurſe. As they advance in life, the girls are taught to ſpin cotton, and to beat corn, and are inſtructed in other domeſtic duties; and the boys are employed in the labours of the field. Both ſexes, whether Buſhreens or Kafirs, on attaining the age of puberty, are circumciſed. This painful operation is not conſidered by the Kafirs ſo much in the light of a religious ceremony, as a matter of convenience and utility. They have, indeed, a ſuperſtitious notion, that it contributes to render the marriage ſtate prolific.

When a young man takes a fancy to a young girl, and wiſhes to marry her, it is by no means conſidered as neceſſary that he ſhould make an overture to the girl herſelf. The firſt object is to agree with the parents, concerning the recompence to be given them for the loſs of the company and ſervices of their daughter. The value of two ſlaves is a common price, unleſs the girl is thought very handſome; in which caſe, the parents will raiſe their demand very conſiderably. If the lover is rich enough, and willing to give the ſum demanded, he then communicates his wiſhes to the damſel: but her conſent is by no means neceſſary to the match; for if the parents agree to it, and eat a few *kolla-nuts*, which are preſented by the ſuitor as an earneſt of the bargain, the young lady muſt either have the man of their choice, or continue unmarried, for ſhe cannot afterwards be given to another. If the parents ſhould attempt it, the lover is then authoriſed, by the laws of the country, to ſeize upon the girl as his ſlave. At the celebration of a marriage, no religious ceremony ſeems to be practiſed. A ſelect number of people are indeed invited to the wedding, and feaſted; but conſummation conſtitutes the marriage; for towards the morning, the new married couple are always diſturbed by the women, who aſſemble to inſpect the nuptial ſheet (according to the manners of the ancient Hebrews, as recorded in Scripture), and dance round it. This ceremony is thought indiſpenſably neceſſary; nor is the marriage conſidered as valid without it.

The Mandingoes, and indeed all the negro ſtates, whether Mahomedan or Pagan, allow a plurality of wives. The conſequence is, that the wives frequently quarrel among themſelves. When this happens, the huſband decides between them; and ſometimes finds it neceſſary to adminiſter a little corporal chaſtiſement before tranquillity can be reſtored. But if any one of the ladies complains to the chief of the town, that her huſband has unjuſtly puniſhed her, and ſhewn an undue partiality to ſome other of his wives, the affair is brought to a public trial. In theſe *palavers*, however, which are conducted chiefly by married men, our author was informed, that the complaint of the wife is not always conſidered in a very ſerious light; and the complainant herſelf is ſometimes convicted of ſtrife and contention, and left without remedy. If ſhe murmurs at the deciſion of the court, the magic rod of *Mumbo Jumbo* ſoon puts an end to the buſineſs. See MUMBO JUMBO in this *Suppl.*

A child, among them, is named when it is ſeven or eight days old. The ceremony commences by ſhaving the infant's head; and a diſh called *dega*, made of pounded corn and ſour milk, is prepared for the gueſts. If the parents are rich, a ſheep or a goat is commonly added. This feaſt is called *ding koon lee*, "the child's head ſhaving." During Mr Park's ſtay at Kamalia, he was preſent at four different feaſts of this kind, and the ceremony was the ſame in each, whether the child belonged to a Buſhreen or a Kafir. The ſchoolmaſter, who officiated as prieſt on thoſe occaſions, and who is neceſſarily a Buſhreen, firſt ſaid a long prayer over the *dega*; during which, every perſon preſent took hold of the brim of the calabaſh with his right hand. After this, the ſchoolmaſter took the child in his arms, and ſaid a ſecond prayer; in which he repeatedly ſolicited the bleſſing of God upon the child, and upon all the company. When this prayer was ended, he whiſpered a few ſentences in the child's ear, and ſpit three times in its face; after which he pronounced its name aloud, and returned the infant to the mother. This part of the ceremony being ended, the father of the child divided the *dega* into a number of balls, one of which he diſtributed to every perſon preſent. And inquiry was then made, if any perſon in the town was dangerouſly ſick; it being uſual, in ſuch caſes, to ſend the party a large portion of the *dega*, which is thought to poſſeſs great medical virtues.

The Mandingoes have no artificial method of dividing time. They calculate the years by the number of *rainy ſeaſons*. They portion the year into *moons*, and reckon the days by ſo many *ſuns*. The day they divide into morning, mid day, and evening; and further ſubdivide it, when neceſſary, by pointing to the ſun's place in the heavens. Our author frequently inquired of ſome of them, what became of the ſun during the night, and whether we ſhould ſee the ſame ſun, or a different one, in the morning? But that ſubject appeared to them as placed beyond the reach of human inveſtigation; they had never indulged a conjecture, nor formed any hypotheſis, about the matter. The moon, by varying her form, has more attracted their attention. On the firſt appearance of the new moon, which they look upon to be newly created, the Pagan natives, as well as Mahomedans, ſay a ſhort prayer; and this ſeems to be the only viſible adoration which the Kafirs offer up to the Supreme Being. This prayer is pronounced in a whiſper; the party holding up his hands before his face: its purport is to return thanks to God for his kindneſs through the exiſtence of the paſt moon, and to ſolicit a continuation of his favour during that of the new one. At the concluſion, they ſpit upon their hands, and rub them over their faces. Great attention is paid to the changes of this luminary in its monthly courſe; and it is thought very unlucky to begin a journey, or any other work or conſequence, in the laſt quarter. An eclipſe, whether of the ſun or moon, is ſuppoſed to be effected by witchcraft. The ſtars are very little regarded; and the whole ſtudy of aſtronomy appears to them as a uſeleſs purſuit, and attended to by ſuch perſons only as deal in magic.

Their notions of geography are equally puerile. They imagine that the word is an extended plain, the termination of which no eye has diſcovered; it being, they ſay, overhung with clouds and darkneſs. They deſcribe the ſea as a large river of ſalt water, on the farther ſhore of which is ſituated a country called *Tobaubo doo;* "the land of the white people." At a diſtance from Tobaubo doo, they deſcribe another country, which they allege is inhabited by cannibals of gigantic ſize, called *Koomi*.

Mr Park ſays he has converſed with all ranks and conditions of negroes on the ſubject of their faith, and that he can pronounce, without the ſmalleſt ſhadow of doubt, that the belief of one God, and of a future ſtate of reward and puniſhment, is entire and univerſal among them. It is remarkable, however, that, except on the appearance of a new moon, as before related, the Pagan natives do not think it neceſſary to offer up prayers and ſupplications to the Almighty. They repreſent the Deity, indeed, as the creator and preſerver of all things; but in general they conſider him as a being ſo remote, and of ſo exalted a nature, that it is idle to imagine the feeble ſupplications of wretched mortals can reverſe the decrees, and change the purpoſes, of unerring wiſdom. The concerns of this world, they believe, are committed by the Almighty to the ſuperintendance and direction of ſubordinate ſpirits, over whom they ſuppoſe that certain magical ceremonies have great influence. A white fowl, ſuſpended to the branch of a particular tree, a ſnake's head, or a few handfuls of fruit, are offerings which ignorance and ſuperſtition frequently preſent, to deprecate the wrath, or to conciliate the favour, of theſe tutelary agents.

The Mandingoes ſeldom attain extreme old age. At forty, moſt of them become grey haired, and covered with wrinkles; and but few of them ſurvive the age of fifty-five, or ſixty. Yet their diſeaſes appeared but few; fevers and fluxes being the moſt common, and the moſt fatal. For theſe they generally apply *ſaphies*, i. e. charms, to different parts of the body; though ſometimes, on the firſt attack of a fever, the patient is, with great ſucceſs, placed in a ſort of vapour bath. The other diſeaſes which prevail among the negroes, are the *yaws*, the *elephantiaſis*, and a *leproſy* of the very worſt kind, together with the *Guinea worm*, which they attribute to bad water.

When a perſon of conſequence dies, the relations and neighbours meet together, and manifeſt their ſorrow by loud and diſmal howlings. A bullock or goat is killed for ſuch perſons as come to aſſiſt at the funeral; which generally takes place in the evening of the ſame day on which the party died. The negroes have no appropriate burial places, and frequently dig the grave in the floor of the deceaſed's hut, or in the ſhade of a favourite tree. The body is dreſſed in white cotton, and wrapped up in a mat. It is carried to the grave, in the duſk of the evening, by the relations. If the grave is without the walls of the town, a number of prickly buſhes are laid upon it, to prevent the wolves from digging up the body; but our author never obſerved that any ſtone was placed over the grave as a monument or memorial.

With reſpect to employment, the men cultivate the ground, or catch fiſh in large rivers; while the women manufacture cotton cloth. It is only the ſpinning and the dying, however, that are performed by the women; for the web, which is ſeldom more than four inches broad, is wove by the men in a loom made exactly upon the ſame principle as that of Europe. As the arts of weaving, dyeing, ſewing, &c. may eaſily be acquired, thoſe who exerciſe them are not conſidered in Africa as following any particular profeſſion; for almoſt every ſlave can weave, and every boy can ſew. The only artiſts which are diſtinctly acknowledged as ſuch by the negroes, and who value themſelves on exerciſing appropriate and peculiar trades, are the manufacturers of leather and of iron. The firſt of theſe are called *Karrankea* (or as the word is ſometimes pronounced *Gaungay)*. They are to be found in almoſt every town, and they frequently travel through the country in the exerciſe of their calling. They tan and dreſs leather with very great expedition, by ſteeping the hide firſt in a mixture of wood aſhes and water, until it parts with the hair; and afterwards by uſing the pounded leaves of a tree, called *goo*, as an aſtringent.

The manufacturers in iron are not ſo numerous as the *Karrankeas;* but they appear to have ſtudied their buſineſs with equal diligence. The negroes on the coaſt being cheaply ſupplied with iron from the European traders, never attempt the manufacturing of this article themſelves; but in the inland parts, the natives ſmelt this uſeful metal in ſuch quantities, as not only to ſupply themſelves from it with all neceſſary weapons and inſtruments, but even to make it an article of commerce with ſome of the neighbouring ſtates. During our author's ſtay at Kamalia, there was a ſmelting furnace at a ſhort diſtance from the hut where he lodged, and the owner and his workmen made no ſecret about the manner of conducting the operation; and readily allowed him to examine the furnace, and aſſiſt them in breaking the iron-ſtone. The proceſs it is needleſs to deſcribe; though it be proper to obſerve, that the maſs of metal obtained by it was rather ſteel than iron. Moſt of the African blackſmiths are acquainted alſo with the method of ſmelting gold, in which proceſs they uſe an alkaline ſalt, obtained from a ley of burnt corn-ſtalks evaporated to dryneſs. They likewiſe draw the gold into wire, and form it into a variety of ornaments, ſome of which are executed with a great deal of taſte and ingenuity.

The reader will obſerve, that in the extracts which we have made from Mr Park's intereſting travels, the terms African and Negro are frequently uſed as if all Africans and Negroes were Mandingoes. The reaſon is, that the Mandingoes were not only the moſt numerous tribe which he viſited, but were alſo ſpread over all that tract of country which he traverſed.

MANGEEA, an iſland of the S. Seas, viſited by Captain Cook in the beginning of his laſt voyage. The coaſt is guarded by a reef of coral rocks, againſt which a heavy ſurf is continually breaking. The iſland is about 15 miles in circumference. The inhabitants appear of a warlike diſpoſition. S. lat. 21° 27′, W. long. 158° 7′.—*Morse*.

MANHEIM, a town of Pennſylvania, in the county of Lancaſter. It contains about 60 houſes, and a

Dutch church. Glaſs works were erected here previous to the revolution, but they are fallen to decay. It is 11 miles N. by W. of Lancaſter, and 77 W. by N. of Philadelphia.—Alſo the name of a town in Lincoln county, Maine. There is another of the ſame name in York county, Pennſylvania.—*ib.*

MANIANA, a ſmall negro kingdom lying between 12° and 14° North Lat. and between the meridian of Greenwich and 1° and 30′ Weſt Long. Its inhabitants, as Mr Park was informed by a variety of people in many different kingdoms, are remarkable for cruelty and ferocity; carrying their reſentment to their enemies ſo far as never to give quarter, and even indulging themſelves with banquets of human fleſh. Hence the inhabitants of Bambarra, who carried on with them a long and bloody war, and muſt of courſe be well aſcertained of the fact, called them *Ma dummulo*, which ſignifies men-eaters.

MANICOUAGAN, or *Black River*, riſes from a lake of its name, in Lower Canada; runs a ſouthern courſe, and falls into the St Lawrence 85 miles N. E. of Tadouſac.—*Morſe.*

MANIEL, or rather *Bahoruco*, mountains in the iſland of Hiſpaniola or St Domingo, 20 miles in circumference, and almoſt inacceſſible. They have been for 80 years paſt the place of refuge of the fugitive Spaniſh and French negroes. Theſe brigands have as yet always defied their purſuers. The ſoil of theſe mountains is fertile, the air temperate, and the ſtreams in them abound with gold duſt.—*ib.*

MANILLON, a townſhip in Fayette county, Pennſylvania.—*ib.*

MANITOUALIN, a cluſter of iſlands near the northern ſhore of Lake Huron, conſidered as ſacred by the Indians.—*ib.*

MANLIUS, a townſhip in Onondago county, New-York, incorporated in 1794, and is the ſeat of the county courts. It is well watered by Butternut, Limeſtone, and Chittenengo creeks, which unite at the N. E. corner of the town; and the ſtream, aſſuming the latter name, runs north to Oneida lake, which is 10 miles northerly of the centre of the town. It comprehends that part of the Onondago reſervation bounded ſoutherly by the Geneſſee road, and weſterly by Onondago creek and the Salt lake. Of its inhabitants 96 are electors, according to the State cenſus of 1796.—*ib.*

MANMIC. Indian villages on the Picaway fork of the Manmic, or Miami of the lake, and St Mary's river.—*ib.*

MANNINGTON, a townſhip in Salem county, New-Jerſey.—*ib.*

MANOR, a townſhip in Lancaſter county, Pennſylvania.—*ib.*

MANSEL, an iſland in the N. E. part of Hudſon's bay, between Southampton iſland and the coaſt of Labrador. N. lat. 62° 38′.

MANSFIELD, a townſhip in Suſſex county, New-Jerſey, containing 1482 inhabitants, including 35 ſlaves. It is ſituated on Muſconecunk river, about 7 miles ſouth-eaſterly of Oxford, and as far northerly of Greenwich.—*ib.*

MANSFIELD, a townſhip in Briſtol county, Maſſachuſetts, ſituated 30 miles ſoutherly of Boſton. It was incorporated in 1770, and contains 983 inhabitants.—*ib.*

MANSFIELD, a townſhip in Chittenden county, Vermont, between La Moille and Onion rivers, about 7 miles diſtance from each, and 113 miles N. by E. of Bennington.—*ib.*

MANSFIELD, a townſhip in Burlington county, New-Jerſey, on the S. ſide of Black's creek, conſiſting of 19,000 acres, of an excellent ſoil, noted for its fine paſtures and large dairies. It is 8 miles W. by N. of Burlington, and 12 S. by E. of Trenton. The inhabitants are moſtly Friends.—*ib.*

MANSFIELD, a townſhip in Windham county, Connecticut, about 30 miles north of New-London, and as far eaſt of Hartford.—*ib.*

MANTA, a bay of Guayaquil, in South-America, formerly famous for a conſiderable pearl fiſhery; but it has been totally diſcontinued for ſome years. There is alſo a point of this name on the coaſt near it. The bay has its name from the great numbers of large fiſh, called *mantas*, the catching of which is the common employment of the inhabitants. The method of carrying on this fiſhery is as follows: they throw into the water a log of wood, about 18 feet long, and near a foot in diameter; on one end they place their net, and on the other an Indian ſtands in an erect poſition, and with a ſingle oar rows his tottering bark to the diſtance of half a league from the ſhore, where he ſhoots his net; another Indian follows on a ſimilar log, takes hold of the rope faſtened to one end of the net, and when fully extended, they both make towards the land, hauling the net after them. It is aſtoniſhing to obſerve with what agility the Indians maintain an equilibrium on theſe round logs, notwithſtanding the continual agitations of the ſea, and their being obliged to mind the oar and the net at the ſame. They are indeed excellent ſwimmers; ſo that if they ſlip off they are immediately on the log again, and in their former poſition.—*ib.*

MANURE is ſo eſſential to agriculture, that the want of it, or an improper manner of uſing it, is the principal cauſe of the ſterility of a country. We have therefore treated of manures and their action at ſome length in the article AGRICULTURE in the *Encyclopædia*; but as the theoretical part of that diſquiſition reſts in a great meaſure on the doctrine of phlogiſton, which is now exploded, it may not be improper to reſume the ſubject here. Experience however being, after all, the only guide which the farmer can ſafely and confidently follow, inſtead of amuſing our readers with theories of our own, we ſhall lay before them the obſervations of a man who ſeems to have united theory with practice.

"The uſe of manures (ſays M. Parmentier*) has been known in all ages, but we are yet far from having any clear and preciſe ideas of the nature of the juices which are deſtined for the nouriſhment of vegetables, and of the manner in which they are tranſmitted to their organs. The writers on agriculture, who have endeavoured to explain theſe matters, perceiving ſalts in moſt plants, were perſuaded that theſe ſalts, by the help of water and heat, paſſed, in a ſaline form, through the vegetable filter. Theſe firſt philoſophers did not heſitate to conſider every thing that has been done by the induſtry of man, to improve the nature of land, and its productions, as merely forming reſervoirs of theſe ſalts, which they conſidered as the principle of fertility. This opinion was ſo well eſtabliſhed among the improvers of land, that, to this day, many of them have no object in view, in their operations, but to diſengage ſalts; and, when they attempt to explain certain phenomena which take place in their fields or orchards, they talk confidently about the *nitre of the air*, *of rain*, *of ſnow*, *of dew*, *and fogs*; of the *ſalts of the earth*, *of dung*, *of marle*, *of lime*, *of chalk*, &c. and make uſe of thoſe vague terms, *oil*, *ſulphur*, *ſpirit*, &c. which ought henceforward to be baniſhed from our elementary books on agriculture.

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* *Memoirs of the Royal Society of Agriculture, Paris.*

“ Among the authors who have attacked, and combated with moſt ſucceſs, the opinion that the fruitfulneſs of ſoils, and the aliment of vegetables, reſide in ſaline ſubſtances, muſt be reckoned Eller and Wallerius. Theſe philoſophers examined, by every means which chemiſtry at that time could furniſh, the various kinds of earth proper for cultivation, and alſo thoſe ſubſtances which have always been conſidered as the moſt powerful manures, without being able to obtain, from any of them, any thing more than mere atoms of ſalt.

“ Animated with the ſame zeal, and taking advantage of the inſtructions found in their writings, I thought it neceſſary to determine, by experience, whether, as has been aſſerted, there really exiſt neutral ſalts in earths; and alſo, whether thoſe earths are more fertile in proportion to the quantity of ſuch ſalts they contain. With this view, I lixiviated, by means of diſtilled water, many ſpecies of cultivated earths, taken in various ſtates, from freſh earth to that which had been impoveriſhed by the growth of ſeveral crops; I alſo tried dung, reduced more or leſs into the ſtate of mould; and likewiſe the moſt active manures, ſuch as the offal of animal ſubſtances rotted by putrefaction; but in none of theſe, however carefully analyzed, were found any ſalts in a free ſtate. They contain indeed the materials proper for forming ſalts, but if they contain any ready formed, it is merely by accident.

“ The reſearches of Kraft, and thoſe of Alſton, were not attended with different reſults. Having ſown ſome oats in aſhes, not lixiviated, and in ſand ſtrongly impregnated with potaſh and with ſaltpetre, and having found that the oats did not grow, they concluded that neutral ſalts, and alkalies, not only retarded the growth of vegetables, but that they abſolutely prevented it. It is well known that in Egypt there are diſtricts where the earth is entirely covered with ſea-ſalt, and theſe diſtricts are quite barren. It is probably owing to this property of ſea-ſalt, that the Romans were accuſtomed to ſcatter large quantities of it over fields where any great crime had been committed, and of which they wiſhed to perpetuate the remembrance, by rendering the part barren for a certain time.

“ The idea that ſalts had great influence in vegetation, ought to have been greatly weakened by the following ſimple reflection. Suppoſing that ſalts exiſted in garden mould, they would be very ſoon diſſolved by the rain, and carried away, towards the lower ſtrata of the earth, to a depth to which the longeſt roots would not reach. Indeed the famous experiment of Vanhelmont would have been ſufficient to have deſtroyed the above opinion, if it did not generally happen that we are no ſooner ſet free from one error than we fall into another not leſs extraordinary. The ſurpriſing effects of vegetation brought about by the overflowing of water, and in the neighbourhood of ſalt marſhes, and the infinite number of inhaling capillary tubes obſerved upon the ſurface of vegetables, led to an opinion that the air and water, abſorbed by the roots and leaves of plants, were only vehicles loaded with ſaline matter, analogous to the vegetables nouriſhed by them.

“ To the experiment of Vanhelmont, which was repeated by many accurate obſervers, ſucceeded thoſe of modern philoſophers; from which it clearly appeared, that plants could grow, and produce fruit, in the air of the atmoſphere, and in diſtilled water, alſo in pure ſand, in powdered glaſs, in wet moſs or ſponge, in the cavity of fleſhy roots, &c. and that plants which had nothing but the above-mentioned fluids for their nouriſhment, gave, when ſubmitted to chemical analyſis, the ſame products as thoſe which had undergone their proceſs of vegetation in a ſoil perfectly well manured. It was alſo obſerved, that the moſt barren ſoils were rendered fertile when they were properly ſupplied with water by canals; and the efficacy of irrigation was repeatedly evinced in different ways: from theſe obſervations was formed the following ſyſtem, that water riſes in plants in the form of vapour, as in diſtillation; that air introduces itſelf into their pores; and that, if ſalts contribute to the fruitfulneſs of ſoils, it is only in conſequence of their containing the two fluids above-mentioned in great abundance.”

Our author, after making many experiments upon various ſoils and ſalts, and after attending minutely to the proceſs of vegetation, thinks himſelf warranted to maintain, “ that ſaline ſubſtances have no ſenſible effects in promoting vegetation, except inaſmuch as they are of a deliqueſcent nature, have an earthy baſis eaſily decompoſed, and are uſed only in ſmall quantity. In thoſe circumſtances they have the power of attracting, from the immenſe reſervoir of the atmoſphere, the vapours which circulate in it; theſe vapours they retain, along with the moiſture that is produced from rain, ſnow, dew, fog, &c. which moiſture they prevent from running together in a maſs, or from being loſt, either by exhaling into the air of the atmoſphere, or by filtering itſelf through the inferior ſtrata of the earth, and thereby leaving the roots of vegetables dry; they diſtribute that moiſture uniformly, and tranſmit it, in a ſtate of great diviſion, to the orifices of the tubes deſtined to carry it into the texture of the plant, where it is afterwards to undergo the laws of aſſimilation. As every kind of vegetable manure poſſeſſes a viſcous kind of moiſture, it thereby partakes of the property of deliqueſcent ſalts. In ſhort, the preparation of land for vegetation has no other object in view but to divide the earthy particles, to ſoften them, and to give them a form capable of producing the above mentioned effects. It is ſufficient, therefore, that water, by its mixture with the earth and the manure, be divided, and ſpread out ſo as to be applied only by its ſurface, and that it keep the root of the plant always wet, without drowning it, in order to become the eſſential principle of vegetation. But as plants which grow in the ſhade, even in the beſt ſoil, are weakly, and as the greater part of thoſe which are made to grow in a place that is perfectly dark neither give fruit nor flowers, it cannot be denied that the influence of the ſun is of great importance in vegetable economy."

Such was the opinion which our author gave of the manner in which ſalts act in vegetation, at a time when it was not known that air and water (which had been ſo long conſidered as elements), far from being ſimple ſubſtances, are capable of being decompoſed by a great variety of operations both of nature and art; and nothing was wanting to complete his theory, but to know that air and water act their part in vegetation only in a ſtate of decompoſition; and that if earth well manured is a better matrix than water itſelf, it is becauſe ſuch earth has the power of converting the water into gaſes which are eaſily abſorbed, and which, while their abſorption takes place, communicate to the plants a motion and heat which they received when taking the form of gas, and which they loſe when they enter again into combination; whence it is natural to conclude, that this motion and this heat muſt neceſſarily develope themſelves in ſeeds, and maintain the vital action in plants.

What is a vegetable, conſidered chemically, according to the preſent ſtate of our knowledge? It is, ſay the chemiſts, a compound of hydrogen, oxygen, and carbon, the proportions of which vary according to the agents which have concurred to its developement, and according to the matrix which received and aſſimilated them, in order to create thoſe combinations which are varied to infinity, by their forms and properties, and known by the generic terms of ſalt, oil, and mucilage. It appears, therefore, needleſs to ſeek theſe combinations in the different ſubſtances which are uſed for manure, when we wiſh to determine the nature of them, and explain their manner of acting in vegetation; becauſe, ſuppoſing it true that theſe ſalts, theſe oils, or theſe mucilages, exiſt in their combined ſtate, nothing but their conſtituent elements, namely, hydrogen, oxygen, and carbon, can poſſibly have any action.

The ſuperiority of animal ſubſtances, as manures, and the remarkable luxuriance of thoſe plants which are watered with putrid water, prove inconteſtibly, that the putrid ſtate is favourable to vegetation, and that every ſubſtance which is liable to enter, to a certain degree, into that ſtate, contributes very powerfully thereto. The moſt aerated waters are, in this caſe, the moſt beneficial. It is obſerved that rain, particularly in ſtormy weather, quickens vegetation ſo much, that the gardeners in the neighbourhood of Paris are often obliged to drench their plants with water taken from their wells, which, in conſequence of its rawneſs, or its want of air, retards the vegetation of the plants; either becauſe it precipitates the meteoriſed or electrified water, or becauſe, by being mixed with the other water, it diminiſhes its fertilizing quality; whereas, in ſummer, this ſame well-water, by being expoſed to the ſun for ſome days, acquires a ſmell like that of ſtale eggs, loſes its rawneſs, and becomes very fit for accelerating vegetation. An atom of vegetable or animal matter is, at that time, ſufficient to bring about more quickly this ſtate of putrefaction; while theſe ſame ſubſtances, by being employed in certain proportions, far from acting as a leaven on the liquids which hold them in ſolution, preſerve thoſe liquids, or at leaſt make them more ſlow to change.

Salts and dung, therefore, are not merely decompoſed by the power of vegetation; by furniſhing the reſults of their decompoſition, they alſo act in the manner of leavens, the action of which is ſcarcely perceptible in cold or dry weather; but when they are heated by the ſun, and ſufficiently penetrated with moiſture, they very ſoon enter into a ſort of fermentation, ſuffering the various gaſes with which they are provided to eſcape. Thus manures may be conſidered as decompoſing inſtruments, provided by nature, and prepared by art, to act upon water ſo as to bring it to a proper ſtate of attenuation. The ſubſtances which enter into the compoſition of plants are, therefore, nothing but products of the decompoſition of air and water, and combinations of the conſtituent principles of theſe two fluids, determined by the power which preſides in the ſeed, and which thence has paſſed into the plant.

It is now eaſy to account for the effects of charcoal-powder, ſtraw, &c. which are made uſe of to cover ground during long droughts with undoubted benefit: they are mechanical means of preventing the diſſipation of moiſture, and of determining it to take the form of thoſe gaſeous fluids which have ſuch powerful effect in vegetation. As water is compoſed of hydrogen and oxygen, it is not ſurpriſing that, when aſſiſted by the influence of the ſun, and that of electricity, it is capable of forming, almoſt by itſelf, the ſolids and fluids of vegetables; taking from the atmoſphere the carbon it ſtands in need of, to give them their moſt eſſential characters. We ſay their moſt eſſential characters; for thoſe terreſtrial plants which have grown in air and water do not abound in principles, and their offspring, when they have any, is by no means vigorous. We ſee alſo, that plants which are naturally of an aquatic nature, have in general but little ſmell, becauſe the medium in which they live and grow furniſhes only a ſmall quantity of carbon, in proportion to the hydrogen and oxygen, which are the conſtituent principles of water. This is the reaſon why, in cold and wet years, flowers are leſs odoriferous, fruit leſs full of flavour, and more difficult to be preſerved. The germ of their reproduction is weak; and they are, if the expreſſion may be uſed, in a ſort of dropſy; that is to ſay, they are loaded with the principles which conſtitute water, and even with water itſelf.

Theſe obſervations, to which more might be added, may ſerve to explain why vegetation is ſlow and weak in a ſoil which is too much charged with ſaline matter, while it is rendered quick and vigorous by a ſmall quantity of this ſame matter; and why earth, which is perfectly lixiviated, and watered, from time to time, with diſtilled water only, is capable of giving to bitter plants their bitterneſs, to ſweet ones their ſweetneſs, to acid ones their acidity, to aromatic ones their ſpicineſs, and to poiſonous ones their deleterious qualities; in ſhort, why the inherent characters of plants are more ſtrongly marked, in proportion as the ſoil in which they grow is furniſhed with natural or mechanical means to produce a quantity of gas neceſſary to the formation of the ſubſtances on which thoſe characters depend.

If a nitrous or marine plant can, even when growing in a ſoil deſtitute of nitre or ſea-ſalt, occaſion the production of theſe ſalts, it muſt be allowed that ſuch plants would vegetate more ſtrongly, and contain more of ſuch ſalts, if they grew in ſoils more abounding in materials proper to form them. Thus, the different ſpecies of ſamphire, glaſſwort, ſea wrack, &c. flouriſh on the borders of the ſea, ſuch ſoils being ſtrongly impregnated with the fluids neceſſary to form the muriatic gas and ſea ſalt which enter into the compoſition of thoſe plants; while the ſun flower, pellitory, &c. ſucceed beſt in earth which is mixed with the ruins of old buildings, in which the materials for the production of nitrous gas, and even of nitre itſelf, are very abundant. In ſhort, the organization of theſe plants is a real elaboratory for forming the forementioned ſalts.

Thoſe plants which, for their vegetation, require the moſt aſſiſtance from the ſoil and manure, are very apt to contract a diſagreeable taſte, if either the ſoil or manure are capable of ſupplying the principles from which it is acquired. The claſs *tetradynamia*, particularly all ſorts of cabbages (which contain ſulphur ready formed), contract a bad taſte in a ſoil compoſed of mud and dung, becauſe theſe ſubſtances, as they are decompoſed, furniſh a great quantity of hepatic gas, or of ſulphuriſed hydrogen gas; yet plants of another claſs may grow in the ſame ſoil, cloſe by the cabbages, without partaking even in the ſmalleſt degree of the bad taſte of the latter. The plants laſt mentioned, when growing in hepatic gas, retain only ſo much of it as is ſufficient for the production of the ſubſtances of which they are formed; the overplus, which could not be aſſimilated, is thrown out by the excretory veſſels, after undergoing thoſe modifications which the digeſtive juices and organization of the plant, and the ſtate of the atmoſphere, have produced.

Thus we ſee that thoſe plants which abound moſt in oily, ſaline, and mucilaginous principles, are generally ſuch as require a ſoil well manured. Tobacco, for inſtance, gives forty pounds of alkaline ſalt or potaſh from every hundred weight of aſhes: this plant may, by being buried in the ground, be converted into a very powerful manure; while other plants, which thrive in a middling ſoil, and appear as vigorous, are, in general, ſuch as have not ſo great a quantity of principles in their compoſition, and when thrown on the dunghill, and left to rot, furniſh very little manure. From ſuch obſervations, it may perhaps not be impoſſible hereafter to judge, by the analyſis of a plant, not only whether it requires a large or a ſmall quantity of manure, but likewiſe what kinds of ſoil and manure are moſt fit to promote its vegetation: wild plants alſo may ſerve to ſhew the nature of the ſoil which they ſeem moſt to flouriſh in.

Beſides the phyſical action of manures, they have a very evident mechanical action. When mixed with earth, in a certain proportion, they not only render it more permeable to water, but the roots of plants can, with greater eaſe, acquire their proper ſize and form in it: in other caſes, manures tend to unite that earth which is too looſe, and, by rendering it more tenacious, they prevent the water from being loſt, and the roots from becoming dry. Thoſe manures which are called *warm* are ſuited to cold lands, not only becauſe they render them leſs compact, but alſo becauſe they take off a part of that moiſture which ſuch lands always have in too great quantity. Cold manures, on the other hand, by their viſcid quality, give tenacity to dry and hot ſoils, attracting and retaining, for a longer time, the moiſture which comes in their way. The nature of the ſoil muſt therefore determine what kind of manure it ſtands in need of, and alſo whether cultivating it by means of oxen or by horſes is preferable; for the manures produced from theſe two animals have thoſe oppoſite qualities which we have above deſcribed. By ſuch obſervations, we ſhall perhaps be able to reſolve a queſtion, reſpecting which the ſentiments of cultivators in many parts of the kingdom are much divided.

It cannot, however, be denied, that the earth is able of itſelf to ſerve as a baſis and ſupport to plants, and that it has an action more or leſs evident upon air, upon water, and upon dung. There is a well-known method of diſtinguiſhing clay from other earths; by merely breathing upon it, a ſmell is immediately perceived, ſufficiently ſtrong to ſhew that a decompoſition and freſh combination have taken place. In ſummer, after a drought of ſome days continuance, there always ariſes in the fields a particular ſmell during a ſhower of rain; and there is no kind of vegetable manure which, when mixed with earth, does not ſend forth a ſmell. This proves that the nature of the ſoil muſt have an influence, not only upon air and upon water, but alſo upon the effect of manures; and that before we ſpeak of their power, we ſhould always ſpecify what kind of earth they were applied to; becauſe when manures and earth are mixed together, there enſues an action and reaction more or leſs favourable to vegetation.

Having examined to what degree air and water enter, in ſubſtance, into the veſſels of plants, and having ſhewn that the principal action of earth, of ſalts, and of manures, conſiſts in preparing, elaborating, and decompoſing theſe two fluids, and in giving to the products of their decompoſition the forms they require, to accompliſh the purpoſe of nature in vegetation, our author makes ſome obſervations upon the particular effects of certain ſubſtances uſed for improving land, ſuch as marl, lime, chalk, and wood aſhes; which are uſually applied either to an exhauſted ſoil, in order to reſtore it, or to a drooping plant, with a view to give it ſtrength. Of the efficacy of theſe ſubſtances no one doubts, but it does not appear that we are equally agreed reſpecting their manner of acting.

Marl (a manure whoſe effects are well known, and which is found to be of the greateſt benefit in thoſe diſtricts where it can be procured in ſufficient quantity) is capable of acting in the ſame manner as the moſt fertile ſoil, when the principles of which it is compoſed, namely, clay, ſand, calcareous earth, and magneſian earth, are juſtly proportioned to each other. But it is ſometimes compact and tenacious, becauſe it contains a ſuperabundant portion of clay, and at other times porous and friable, becauſe it contains too much ſand, and therefore is not in general fit for vegetation by itſelf. Theſe conſiderations ought always to be our guide when we mean to employ marl as a manure.

It has been ſuppoſed that *to marl* was a ſort of technical expreſſion, intended to denote the bringing together or dividing the earthy particles by means of clay or ſand. It appears to our author, that neither of the above operations can properly be called *marling*; becauſe, in either caſe, all we do is, to put the ſoil into a ſituation to receive and to profit by the influence of the atmoſphere, and that of the manures made uſe of. The peculiar principle of marl is, that part of it which, like lime, acts very powerfully upon the different aeriform fluids, is eaſily reduced to powder, efferveſces with acids, and ſends forth a quantity of air-bubbles when water is poured upon it. Now this matter, which in a particular manner does the office of manure, reſides neither in clay nor in ſand. Upon the proportion of it depends the duration of the fertility it produces; conſequently it is of importance, when we make uſe of marl, to know which of its conſtituent parts it contains in the greateſt proportion, otherwiſe in ſome caſes we ſhould only add one common kind of earth to another. Hence our author infers, that for a chalky ſoil clay is the proper manure, and that in ſuch a ſoil a clay bottom is of more value than a gold mine.

“ Wood-aſhes, as a manure, may be, in ſome reſpects, compared to marl; at leaſt they contain the ſame earths as thoſe which generally enter into the compoſition of marl, but they contain a greater quantity of ſaline ſubſtances, proceeding from the vegetables of which they are the reſidue, and from the proceſs made uſe of in their combuſtion; a proceſs which increaſes their activity, and ſhould render us careful in what manner and for what purpoſes we employ them. Wood-aſhes, when ſcattered over fields, at proper times and in proper quantities, deſtroy weeds, and encourage the vegetation of good plants. But do the aſhes produce this effect by a ſort of corroſive power? I cannot (ſays our author) think it; for in that caſe all kinds of plants would indiſcriminately be acted upon by them, and to a certain degree deſtroyed.

“ Beſides, the aſhes of freſh wood are ſeldom employed until they have been lixiviated, in which ſtate they are deprived of their cauſtic principle; thoſe aſhes which are moſt commonly made uſe of for manure are produced either from wood that has been floated in water, or from turf, or from pit-coal, and contain little or no alkaline ſalt.

“ It appears much more probable that aſhes, when laid upon ground, deſtroy the weeds by a well known effect, namely, by ſeizing with eagerneſs that moiſture which ſerved to produce thoſe weeds, and which in a ſuperabundant quantity is neceſſary to their exiſtence and ſupport. Whereas thoſe plants which have a firmer texture and a longer root, which are rendered ſtrong by age and by having withſtood the rigour of winter, and which are in fact the plants of which the fields are compoſed, do not ſuffer any damage from the application of the aſhes; but, on the contrary, by being freed from the ſuperfluous weeds which ſtifled them, and robbed them of a part of their ſuſtenance, they receive a quantity of nouriſhment proportioned to their wants. The ſtate of relaxation and languour to which they were reduced by a ſuperabundance of water, leaves them, the ſoil gets its proper conſiſtence, and the graſs, corn, &c. acquiring the ſtrength and vigour which is natural to them, ſoon overcome the moſs, ruſhes, and other weeds; thus a good crop, of whatever the field conſiſts of, is produced. It is in the above manner that wood aſhes act, whenever in the ſpring it is neceſſary to apply them to meadows, corn fields, &c. the plants of which are ſtifled and weakened by a luxuriant vegetation of weeds, the uſual conſequence of mild and wet winters.

“ When wood aſhes produce an effect different from what is above deſcribed, it is either becauſe they happen to contain too much alkaline ſalt, or that they are laid on the ground in too great quantity, or that the fields to which they are applied were not ſufficiently wet to reſtrain their action; for when they are ſcattered upon cold ſoils, and buried by the plough before the time of ſowing, they are, like lime, of great ſervice. The laſt-mentioned ſubſtance is very efficacious in other circumſtances; and there is a well-known method of uſing it, practiſed by the Germans, as follows: A heap of lime is formed by the ſide of a heap of poor earth, and water is poured upon the lime: the earth is then thrown over it, and becomes impregnated with the vapours which eſcape from the lime while it is ſlaked. The earth, after being thus aerated, may be ſeparated; and although no lime remains mixed with it, is, by the operation juſt deſcribed, rendered capable of giving a luxuriant vegetation to whatever plants may be put into it.

“ It is poſſible, therefore, to aerate earth as well as fluids; for this purpoſe, by mixing it with certain ſubſtances, during their decompoſition, we muſt attach to it the principles of which thoſe ſubſtances are compoſed; from which there reſults a matter ſo loaded with gas, as to form a more compound ſubſtance, and one which has acquired new properties. The Arabians, for example, who take great pains to improve their land, are accuſtomed to make large pits, which they fill with animals which happen to die: theſe pits they afterwards cover with calcareous or clayey earth; and after ſome time theſe earths, which of themſelves are ſterile, acquire the properties of the richeſt manures.

“ The foregoing obſervations may at leaſt be conſidered as proving, that thoſe ſubſtances which, when employed freſh and in too great quantity, are moſt prejudicial to vegetation, have, on the contrary, an advantageous effect, when they are previouſly made to undergo a fermentation; or when they are mixed with earth or water, in a proportion adapted to the end propoſed. The graſs of fields in which cattle or poultry go to feed, after the firſt or ſecond crop of hay, appears to be dried by the urine and dung of thoſe animals; as if fire had been applied to it; whereas theſe ſame excrementitious ſubſtances, when combined with earth, or diluted with water, are capable, without any other preparation of performing the office of good manure.

“ But if animal ſecretions, when applied in ſubſtance to plants, were capable of acting upon them, as is affirmed, in ſuch a way as to corrode or burn them, how could ſeed which has been ſwallowed, and eſcaped the action of the digeſtive powers, be prolific when thrown out by the animal, after having remained ſo long in its dung? yet we often ſee oats, ſo circumſtanced, grow and produce ſeed. Is it not more conſiſtent with experience and obſervation to ſuppoſe, that theſe excrementitious ſubſtances, being ſtill endowed with animal heat, and with an organic motion, diffuſe round plants in vegetation a deleterious principle or inflammable gas, which deſtroys them; for ſoon after their application, the foliage of the plant grows yellow, dries up, and the plant withers, unleſs there happens a ſhower of rain which revives it. When theſe ſubſtances are diluted, by being mixed with water and earth, they loſe that principle which is ſo deſtructive to vegetable life, and an incipient fermentation augments their power as a manure, ſo that they may be immediately made uſe of without any apprehenſion of injury from their effects.

“ It appears, therefore, that any operation upon excrementitious ſubſtances, by which they are dried and reduced to powder, cannot be practiſed without depriving thoſe ſubſtances of a great part of ſuch of their principles as are eaſily evaporated, and upon which their fluidity depends; theſe principles, when diluted with water, and confined by being mixed with earth, are capable of increaſing the produce of the ſoil. Such is the way in which the huſbandmen in Flanders make uſe of this kind of manure, in the cultivation of a kind of rape or cole ſeed, which is to them a very important branch of agricultural induſtry and commerce; and they never obſerve that the ſap carries up any of thoſe principles which give ſuch manure its offenſive ſmell; nor do they obſerve, that the fodder produced from fields ſo manured, whether eaten freſh or dry, is diſagreeable to their cattle. The excrements of all animals would be injurious to plants, if applied too freſh, or in too great quantity; and a gardener could not commit a greater fault, than to put more than a certain quantity of them into the water he means to make uſe of to water his young plants; in ſhort, this kind of manure is to be uſed in a very ſparing manner; and he that is too prodigal of it will find, to his coſt, that exceſs, even of that which is otherwiſe beneficial, becomes an evil.

“ It muſt certainly be allowed, that excrementitious ſubſtances are a very advantageous manure for cold ſoils, and ſuited to moſt vegetable productions; a long experience of their effects over a large tract of country, and the acknowledged intelligence of the Flemiſh farmers, ought to be conſidered as ſufficient to overcome the prejudice that has been raiſed againſt this ſort of manure. Suppoſing that the bad effects which have been attributed to it, when uſed in the ſtate in which it is taken out of privies, &c. are not the offspring of a prejudiced imagination, they may have ariſen from its having been made uſe of at an improper time, or in too great quantity; or from its having been applied to a ſoil and for the cultivation of plants to which it was not adapted; for we know that the exceſs of any kind of manure changes the ſmell and taſte of plants, and the ſame effect is produced by watering them too frequently. Striking examples of this change are ſeen in the ſtrawberry and in the violet, when ſuch as have grown in the woods are compared to thoſe produced from ſome of our over-manured gardens; alſo in the lettuce, and ſome other plants, when thoſe raiſed for ſale by the gardeners about Paris are compared to thoſe of ſome particular kitchen gardens. In the markets of ſome cities, the carrots, turnips, and potatoes of the fields, are preferred to the ſame kind of roots cultivated by the gardeners (A); for though the laſt are of a larger ſize, they have not ſo good a flavour. Some vegetables, therefore, are like certain wild ſpecies of the animal kingdom; they reſiſt every kind of culture, as thoſe animals reſiſt every effort to tame them.

“ Although experience has taught the Flemiſh farmers, that excrementitious ſubſtances are more active in their natural ſtate than when dried, yet it cannot be denied that drying them, and reducing them into powder, is ſometimes very advantageous, becauſe in that ſtate they are much leſs offenſive, are eaſily tranſported to any diſtance, and may be uſed when moſt convenient or moſt proper. In many cities the inhabitants pay to have their privies emptied: in other places, thoſe who empty them pay for their contents; and it would aſtoniſh any one to be told how great a revenue is produced in the city of Liſle in Flanders by the ſale of this kind of manure. I am, however (ſays our author), far from thinking that it is right, in all caſes, to employ it in the above mentioned ſtate of concentration; it would be better, in my opinion, to follow the example of the Flemiſh farmers, who uſe it the firſt year for the cultivation of plants for oil, or for hemp or flax; and the ſecond year for the beſt kinds of grain: thus obtaining two crops, inſtead of one, without any farther preparation of the land. What is ſaid above may be applied alſo to the manures produced from the dung of cattle, poultry, &c. (particularly to pigeons dung, the moſt powerful manure of its kind), all which, by being dried and powdered before they are uſed, loſe a great portion of their activity. From theſe obſervations another fact may be deduced, namely, that manure ſhould not be taken from the place where it has been thrown together until the ſeaſon of the year and the ſtate of the land are ſuch that it may be put into the ground as ſoon as it is brought to it. In ſome diſtricts a very injurious cuſtom prevails of carrying the manure into the fields, and leaving it there formed into ſmall heaps, expoſed for ſome days to the elements; during which time, either the ſun and wind dry up its natural moiſture, leaving a maſs which is much leſs active; or the rain diſſolves and carries away the extractive part impregnated with the ſalt. This kind of brine, which is the moſt powerful part of the manure, penetrates the earth to a conſiderable depth, and ſhews (by the thick tufts which ariſe in thoſe places, and which produce more ſtraw than grain) that manure ought to be put into the ground as ſoon as it is brought to it, becauſe it then poſſeſſes its full force and effect, and conſequently would be then uſed to the greateſt advantage.

“ We have always at hand the means of compoſing, from a great variety of vegetable and animal ſubſtances, ſuch manures as, when brought into a proper ſtate, and mixed with land, contribute to its fertility. Chemiſtry alſo offers to us a number of ſubſtances, which, although when uſed ſeparately they tend to diminiſh the fertiliſing quality of the earth, are yet capable, by being combined, of forming excellent manures; ſuch, for inſtance, is that ſaponaceous combination which is produced from a mixture of potaſh, oil, and earth. What an advantage it would be, if, inſtead of being ſparing of manure, the inhabitants of the country would endeavour to increaſe the number of theſe reſources, and to render them more beneficial, by employing them in a more effectual manner. How many years had paſſed before it was known that the refuſe of apples and pears, after they are preſſed (and which uſed to be thrown away as uſeleſs), is capable of forming as valuable a manure, in cyder and perry countries, as the refuſe of grapes does in wine countries.”

From what has been obſerved, our author concludes,

(A) We believe they are univerſally preferable.

that manures act, in many circumſtances, like medicines, and conſequently that the ſame ſort of manure cannot be adapted to every ſituation, and every kind of ſoil; we muſt therefore take care to make proper diſtinctions between them. Whoever ſhall pretend that any particular kind of manure may be uſed, with equal benefit, in graſs land, corn-fields, vineyards, orchards, kitchen-gardens, &c. ought to be claſſed amongſt thoſe quacks who undertake to cure all perſons with the ſame remedy, without any regard to their age, conſtitution, &c. It is probably from not having paid ſufficient attention to the forementioned diſtinctions, that ſome authors have found fault with particular manures, while others have ſpoken too highly in their favour. He thinks, however, and we agree with him, that we are ſtill in want of a courſe of comparative experiments upon the various kinds of manures, conſidered according to their influence with reſpect to different ſoils, ſituations, and productions. If this part of rural economy were better underſtood, we ſhould perhaps ſee many places in a ſtate of cultivation, which, on account of the bad quality of their ſoil, have hitherto reſiſted all our endeavours to render them fertile.

Perhaps it would not be proper to diſmiſs this ſubject without noticing Mr Middleton's obſervations on various kinds of manure, which were publiſhed in the Tranſactions of the Society of Arts for the year 1799. This gentleman agrees with Mr Parmentier in recommending the *excrementitious matter of privies* as the moſt powerful of all manures on ſome kinds of ſoil; but he differs from him, and we believe from moſt writers on agriculture, when he affirms, that *wood aſhes*, when ſpread on the graſs in February or March, are of very little ſervice, and that the aſhes of *coal* and even of *peat* are of none upon any kind of land. He likewiſe affirms *ſoot* to be of very little value as a manure, *ſoapmakers waſte* to be of none, or rather to be hurtful; and he ſeems to conſider *malt-duſt*, including the duſt from the malt-kilns, to be, after the ſoil of privies, one of the moſt powerful manures. He affirms, from his own experience, that, with reſpect to fertiliſing power, the ſoil of privies, compared with farm-yard dung, is in the proportion of five to one.

MAOUANA, one of that cluſter of iſlands in the South Sea which were diſcovered by M. Bougainville, and by him named Navigator's Iſlands. It was viſited by La Perouſe in 1787, who deſcribes it as exceedingly rich in every animal and vegetable production neceſſary to the ſuſtenance of man. The two frigates which he commanded had no ſooner approached the ſhore than he diſcovered at the bottom of each creek a number of villages, from whence came innumerable canoes, laden with hogs, cocoa nuts, and other fruits, which were purchaſed for glaſs ware. This was in the evening; and next morning the commerce was renewed in the moſt friendly manner. As early as the dawn of day, the iſlanders had ſurrounded the two frigates with 200 canoes full of different kinds of proviſion, which they would exchange only for beads—in their eſtimation diamonds of the firſt water. Axes, cloth, and all other articles of commerce, they diſdained. Abounding in real bleſſings, they were deſirous of obtaining ſuperfluities alone.

Two boats, filled with empty caſks, were ſent aſhore for freſh water; and Perouſe himſelf accompanied them in his pinnace. A line of ſoldiers was poſted between the beach and the Indians, who amounted to about 200, including a great many women and children. The French commander prevailed upon them all to ſit down under cocoa trees, that were not more than eight toiſes diſtant from the ſhips boats. Each of them had by him fowls, hogs, parrots, pigeons, or fruit, and all wiſhed to ſell them at once, which occaſioned ſome confuſion.

The women, ſome of whom were very pretty, offered their favours, as well as their fowls and fruit, to all thoſe who had beads to give them; and ſoon tried to paſs through the line of ſoldiers, who oppoſed but a feeble reſiſtance to their attempts. Europeans who have made a voyage round the world, eſpecially Frenchmen, have no arms to ward off ſimilar attacks. Accordingly the fair ſavages found little difficulty in breaking the ranks; the men then approached; and the confuſion was growing general; when Indians, who ſeemed to be chiefs, made their appearance with ſticks in their hands, and reſtored order, every one returning to his poſt, and the traffic beginning anew, to the great ſatiſfaction of both buyers and ſellers.

While all this was paſſing with the greateſt tranquillity, and the caſks were filling with water, Perouſe thought he might venture to the diſtance of 200 yards to viſit a charming village, ſituated in the midſt of a wood, or rather of an orchard, all the trees of which were loaded with fruit. The houſes were placed upon the circumference of a circle, of about 150 toiſes in diameter, the interior forming a vaſt open ſpace, covered with the moſt beautiful verdure, and ſhaded by trees, which kept the air delightfully cool. Women, children, and old men, accompanied him, and invited him into their houſes. They ſpread the fineſt and freſheſt mats upon a floor formed of little choſen pebbles, and raiſed about two feet above the ground, in order to guard againſt humidity. He went into the handſomeſt of theſe huts, which probably belonged to a chief; and great was his ſurpriſe to ſee a large cabin of lattice-work, as well executed as any of thoſe in the environs of Paris. The beſt architect could not have given a more elegant curve to the extremities of the ellipſis that terminated the building; while a row of pillars, at five feet diſtance from each other, formed a complete colonnade round the whole. The pillars were made of trunks of trees very neatly wrought, and between them were fine mats laid over one another with great art, like the ſcales of a fiſh, and drawing up and down with cords, like our Venetian blinds. The reſt of the houſe was covered with leaves of the cocoa palm.

This charming country combines the advantages of a ſoil fruitful without culture, and of a climate which renders clothing unneceſſary. The trees that produce the bread fruit, the cocoa-nut, the banana, the guava, and the orange, hold out to theſe fortunate people an abundance of wholeſome food; while the fowls, hogs, and dogs, which live upon the ſurplus of theſe fruits, afford them an agreeable variety of viands. What cold imagination could ſeparate the idea of happineſs from ſo enchanting a place! But Maouana is not the abode of innocence. No arms were indeed perceived; but the bodies of the Indians, covered over with ſcars, proved that they were often at war, or elſe quarrelling among themſelves; while their features announced a ferocity that was not perceptible in the countenances of the women. Nature had, no doubt, ſtamped this character on their faces, by way of ſhewing, that the half ſavage, living in a ſtate of anarchy, is a more miſchievous being than the moſt ferocious of the brute creation.

Of their ferocity and their treachery, Perouſe had too ſoon the moſt complete evidence. M. de Langle, the ſecond in command, went aſhore for freſh water, accompanied by ſixty Frenchmen, officers, ſailors, and ſoldiers. They were received with an air of good humour by crowds of people waiting on the beach with immenſe quantities of fruit and hogs; but this calm was of ſhort duration. The Indians picked a quarrel with them, pelted them with ſtones, thrown with great dexterity and with equal force; and it was with difficulty that, of the ſixty-one, forty-nine reached the ſhips, many of whom were ſeverely wounded. Among the killed were De Langle, and Lamanon the naturaliſt (ſee LAMANON in this *Suppl.*). Perouſe deſcribes the men of Maouana as of gigantic ſtature and of great muſcular ſtrength. See *NAVIGATORS Iſlands* in this *Suppl.*

MAPLETON, a name given to a pleaſant range of excellent farms, 3 miles eaſt of Princeton, in New-Jerſey.—*Morſe.*

MAQUOIT, a bay of ſhoal waters in Caſco-Bay, in the Diſtrict of Main, about 20 miles north of Cape Elizabeth, frequently mentioned in the hiſtory of Maine; where the Indians were uſed to land with their canoes, and from thence carry them to *Pejepſcot Falls*, on Androſcoggin river. This was done with the toil of only 4 hours walk. From theſe falls they went down into Kennebeck river; and from thence continued their route up that river to Weſſerunſett, and thence over to St Lawrence; or turned and went down through Monſeag bay, towards Penobſcot; or from the falls they continued their progreſs up Androſcoggin river, beyond the White Mountains, and over to Connecticut river, and from thence to Lake Memphremagog, and down to the limits of Canada.—*ib.*

MARACAIBO, *Maracaybo*, or *Maracaya*, a ſmall but rich city of Venezuelo, a province of Terra Firma in South-America, ſituated on the weſtern bank of the lake of the ſame name, about 18 miles from its mouth and 73 S. W. of Coro. It is well built, has ſeveral ſtately houſes, very regular, and adorned with balconies, from which there is a proſpect of the lake, which has the appearance of a ſea. Here are about 4000 inhabitants, of whom 800 are able to bear arms. It has a governor ſubordinate to the governor of Terra Firma. Here is a large parochial church, an hoſpital, and 4 convents. Veſſels from 25 to 30 tons frequent this port, with manufactures and merchandize from the places near the lake, which are afterwards put on board Spaniſh ſhips that come hither to buy them. Ships are built at Maracaibo, which trade all over America, and even into Spain, this place being very commodious for ſhip-building. It lies 338 miles eaſt of Rio de la Hacha. N. lat. 10° 51′, W. long. 70° 15′.—*ib.*

MARACAIBO *Lake*, or rather *Gulf*, a large collection of waters, on which the town above mentioned is ſituated. It is near 208 miles long, and in ſome parts, 50 in breadth, running from S. to N. and emptying itſelf into the N. Sea; the entrance of which is well defended by ſtrong forts; but Sir Henry Morgan paſſed by them, plundered ſeveral Spaniſh towns on the coaſt, and defeated a ſquadron which had been ſent to intercept him. As the tide flows into the lake, its water is ſomewhat brackiſh, notwithſtanding the many rivers it receives. It abounds with all ſorts of fiſh, ſome of which are very large. By the navigation of this lake, the inhabitants of Venezuela carry on a trade with thoſe of New Granada. The lake becomes narrower towards the middle, where the town is erected.—*ib.*

MARANHAO, a ſmall iſland at the mouth of the noted rivers Maracu, Topocoru, and Mony, on the N. ſide of the province of Maranhao, or Maranon in Brazil. The iſland is oblong, 45 miles in circuit, very fertile, and well inhabited. The French, who ſeized on it in 1612, built a town here, called St Louis de Maragnan; but it is now in the hands of the Portugueſe, and is a biſhop's ſee. It is very ſtrong, and has a ſtout caſtle built on a rock, towards the ſea, which commands a very convenient harbour. The iſland itſelf is very difficult of acceſs, by reaſon of the rapidity of the three rivers which form it: ſo that veſſels muſt wait for proper winds and ſeaſons to viſit it. Beſides the town mentioned here, are two ſmaller ones, viz. St Andero, on the moſt northern point, and St Jago, on the ſouthern. The natives have about 27 hamlets, each conſiſting of four large huts, forming a ſquare in the middle; all being built of large timber, and covered from top to bottom with leaves: ſo that each may contain 200 or 300 perſons. The inhabitants are ſtrong and healthy, and live to a great age; bows and arrows are their only weapons, with which they are very dextrous: but they are fierce and cruel, eſpecially to their enemies. The continent, 3 or 4 leagues from the iſland, is inhabited by the Tapouytapare, and Toupinambois nations, who are wild and fierce, and divided into 15 or 20 ſuch hamlets, as have been deſcribed above. Contiguous to theſe are the territories of Cuma and Gayeta, inhabited by nearly the ſame ſort of people. The capital, Maragnan, has a harbour at the mouth of the river St Mary, on the Atlantic ocean; 495 miles N. W. of Cape St Roque. S. lat. 2° 27′, W. long. 44° 36′.—*ib.*

MARBLEHEAD, a port of entry and poſt-town in Eſſex county, Maſſachuſetts, 4 miles S. E. of Salem, 19 N. E. of Boſton; containing 1 Epiſcopal and 2 Congregational churches, and 5,661 inhabitants. The harbour lies in front of the town S. E. extending from S. W. to N. E. about one mile and a half in length, and half a mile broad. It is formed by Marblehead neck on the S. and E. and is protected by a ſea wall which, before its late repairs, was in imminent danger of giving way, to the great detriment, if not ruin of the port. A battery and citadel were erected here in 1795, for the defence of the place, by order of Congreſs. The bank fiſhery employs the principal attention of the inhabitants, and more is done of this buſineſs, in this place, than in any other in the State. The exports of the year 1794, amounted to 184,532 dollars. Marblehead was incorporated in 1649, and lies in N. lat. 42° 30′, W. long. 69° 49′.—*ib.*

MARBLETOWN, a townſhip in Ulſter county, New-York, ſituated on the W. ſide of Hudſon's river, and ſome diſtance from it; 8 miles S. W. by S. of Eſopus, and near 80 N. of New-York city. It contains 2,190 inhabitants, including 374 ſlaves. By the State cenſus of 1796, 374 of the inhabitants are electors.—*ib.*

MARCELLUS, a military townſhip in Onondago county, New-York, ſituated on Skaneatetes lake, 11 miles W. of Onondago Caſtle. Marcellus, as incorporated in 1794, comprehends alſo the townſhip of Camillus, part of the Onondago reſervation, and part of the reſerved lands lying S. W. of the Salt Lake. In 1796, 65 of its inhabitants were electors.—*ib.*

MARCUS HOOK, a town in Cheſter county, Pennſylvania, on the weſt ſide of Delaware river, 20 miles below Philadelphia. It contains about 30 families. Here are two rows of piers, or long wharves, to defend veſſels from the driving of ice in winter.—*ib.*

MARECHAUX, *Cape,* forms the N. E. ſide of the bay of Jacmel, in the iſland of St Domingo. N. lat. 18° 18′.—*ib.*

MARECHITES *Indians* inhabit the banks of the river St John, and around Paſſamaquoddy bay. They are eſtimated at 140 fighting men.—*ib.*

MARGALLAWAY, a river which riſes in the Diſtrict of Maine, and croſſes the New-Hampſhire line between Lake Umbagog and a mountain on the north, and runs ſouth-weſtward to Amariſcoggin river. Its mouth is 10 rods wide.—*ib.*

MARGARET's *Bay, St,* a port on the ſouth coaſt of Nova-Scotia, between Proſpect Harbour and Mahone Bay; from which laſt it is ſeparated by a promontory, on which is the high land of Aſpotagoen.—*ib.*

MARGARET's *Iſlands,* in the N. Pacific ocean, were diſcovered by Capt. James Magee, in the ſhip Margaret, of Boſton, in his voyage from Kamſchatka in 1780. Their latitude is 24° 40′ N. long. 141° 12′ E. —*ib.*

MARGARETTSVILLE, a village in Waſhington county, Maryland, about 10 miles S. by E. of Elizabeth-Town and 6 N. E. of William's Port.—*ib.*

MARGOT, the river and heights of Margot are on the E. ſide of the Miſſiſſippi. The river has a weſterly courſe, and is ſaid to be navigable for batteaux a number of miles. The ground below its junction with the Miſſiſſippi, in lat. 35° 28′ N. affords a commanding, airy, pleaſant, and extenſive ſituation for ſettlements; the ſoil is remarkably fertile. About 3 miles below this, the French built Aſſumption Fort in 1736, when at war with the Chickaſaws, but the year after it was demoliſhed, when a peace was concluded. It is 70 miles from the river St Francis, and 104 from the Chickaſaw river.—*ib.*

MARGOT PORT, a maritime village on the N. ſide of the iſland of St Domingo, in 19° 48′ N. lat. 9 leagues weſtward of Cape Francois.—*ib.*

MARIA, *Cape Santa,* is the northern cape at the mouth of La Plata river, in S. America; 9 leagues from the bay of Maldonade, and 20 from Montevideo, a bay ſo called from a mountain which overlooks it. —*ib.*

MARIA SANTA, a town of the audience of Panama, in S. America. It was built by the Spaniards ſoon after they diſcovered the gold mines in its neighbourhood. N. lat. 7° 43′, W. long. 78° 12′.

MARIAGALANTE, one of the Caribbee Iſlands in the Atlantic ocean; ſo called from the ſhip's name in which Columbus diſcovered it, in 1493. It is of an elliptical figure, 4½ leagues from N. to S. and 3 from E. to W. It lies 5 or 6 leagues S. eaſterly of Guadaloupe, above half its ſurface is barren mountains. There are only two pariſhes, the principal at the ſouth defended by a fort called Baſſeterre. It is indifferently watered, but produces 800,000lb. of coffee, 100,000lb. cotton, and 1,000,000lb. of ſugar. The French planted a colony here in 1648. It was taken by the Engliſh in 1692, but the French ſoon ſettled there again, and ſtill poſſeſs it. N. lat. 15° 55′, W. long. 61° 6′.—*ib.*

MARIANNA, was the name given to the diſtrict granted by the Plymouth Council to Captain John Maſon in 1621. It extended from the river Naumkeag, now Salem, round Cape Ann, to Merrimack river, and from the ſea to the heads of theſe rivers, with the iſlands lying within 3 miles of the coaſt.—*ib.*

MARIE, *Cape Dame,* the weſternmoſt point of the iſland of St Domingo, which, with Cape St Nicholas, forms the entrance of the bay of Leogane. N. lat. 18° 38′, W. long. from Paris 76° 51′. The town of this name, ſituated on the cape, is on the north-weſternmoſt part of the ſouth peninſula; 8 leagues weſt of Jeremie, and 60 weſt of Port au Prince. The towns and villages, along the north coaſt of the peninſula, and in the bay or bite of Leogane, between the cape and Port au Prince, are Petit Trou, Anſe a Veau, Maragoane, Petite Goave, Grand Goave, &c.

MARIE, *Straits of,* connect Lakes Superior and Huron, which will permit boats to paſs, but not larger veſſels. Near the upper end of theſe ſtraits, which are 40 miles long, is a rapid, which (though it is impoſſible for canoes to aſcend) may be navigated by boats without danger, when conducted by able pilots. The ſtraits afford one of the moſt pleaſing proſpects in the world: on the left, leading to lake Superior, may be ſeen many beautiful little iſlands that extend a conſiderable way before you; and on the right an agreeable ſucceſſion of ſmall points of land, which project a little way into the water, and contribute with the iſlands to render it delightful.—*ib.*

MARIEL, *Port,* a harbour on the north ſide of the iſland of Cuba, which will admit frigates of 30 guns. —*ib.*

MARIETTA, a poſt-town and ſettlement of the N. W. Territory, ſituated on the Ohio at the mouth of the Muſkingum. The Campus Martius in this town is an elevated public ſquare, founded by the Ohio Company, in the year 1788. The fortification is all of hewn timber, and for appearance, convenience, and defence, of ſuperior excellence. It is more than 30 feet above the high banks of the Muſkingum, and only 159 yards diſtant from that river, with a beautiful natural glacis in front. The town conſiſts of 1,000 houſe-lots of 90 by 180 feet; the ſpacious ſtreets interſect each other at right angles, and there are neceſſary ſquares reſerved for uſe, pleaſure, and ornament. There are but few houſes yet erected. It is 19 miles above Bel-Pre, 86 ſouth-weſt of Wheeling, 146 ſouth-weſt of Pittſburg, 240 northeaſt of Lexington in Kentucky, and 460 W. by S. of Philadelphia. The mouth of Muſkingum river lies in lat. 39° 34′, long. 82° 9′. —*ib.*

MARK's, *St,* a town of E. Florida, at the head of the bay of Apalachy; 180 miles weſt of St Auguſtine, and 105 from the Alachua Savannah. N. lat. 30° 12′, W. long. 85° 45′.—*ib.*

Mark, *St*, a juriſdiction in the weſt part of the iſland of St Domingo, containing 4 pariſhes. Its exports, ſhipped from the town of its name, from Jan. 1, 1789, to Dec. 31, of the ſame year, were 3,065,047lb. white ſugar, 7,931,710lb. brown ſugar, 7,041,852lb. coffee, 3,250,890lb. cotton, 349,819lb. indigo, and various articles to the value of 2,250½ livres: the total value of duties on exportation 116,974 dollars 4 cents. The town of St Mark lies at the head of a bay of its name, which is at the head of the Bay or Bite of Leogane. The bay is formed by Cape St Mark on the ſouth, and Morne au Diable on the north. This town, although ſmall, is reckoned the pleaſanteſt in the iſland. Its commerce is conſiderable. It owes a great deal of its embelliſhments to the attention of M. de Marbois, during his adminiſtration. It is 22 leagues weſt of Hinche, 19½ north-weſt of Port au Prince, 14 ſouth by weſt of Les Gonaives, 30 ſouth of Port de Paix, and 26½ ſouth-weſt of Cape Francois. N. lat. 19° 5′, W. long. 75° 10′.—*ib.*

MARLBOROUGH, a county in the north-eaſt corner of Cheraws diſtrict, on the Great Pedee river, S. Carolina, 25 miles long, and 19 broad.—*ib.*

Marlborough, *New*, a townſhip in Berkſhire county, Maſſachuſetts, containing 1,550 inhabitants. It was incorporated in 1759, and is 135 miles weſt by ſouth of Boſton.—*ib.*

Marlborough, an ancient and wealthy townſhip in Middleſex county, Maſſachuſetts, (the *Okommakameſit* of the Indians) was incorporated in 1660, and contains 1,554 inhabitants. It is 28 miles weſt of Boſton. A mode of manufacturing Spaniſh brown, from a kind of earth or loam, ſaid to reſemble bed-ore, though not impregnated with particles of iron, has lately been diſcovered in this town by an ingenious gentleman. He conſtructed an air furnace, at a trivial expenſe; and in the year 1794, could calcine and prepare for the mill a ton in 24 hours, 6 days in ſucceſſion, without great expenſe of wood. Connoiſſeurs in paints acknowledge it is good. His firſt attempts in making ſpruce yellow were likewiſe flattering.—*ib.*

Marlborough, a townſhip in Windham county, Vermont, having Newfane on the north, Halifax ſouth, Brattleborough eaſt, and Wilmington on the weſt. It contains 629 inhabitants.—*ib.*

Marlborough, a poſt-town in Cheſhire county, New-Hampſhire, ſix miles from Keene, 20 north of Winchendon, and 26 from Aſhburnham in Maſſachuſetts. It was incorporated in 1776, and contains 786 inhabitants.—*ib.*

Marlborough, *New*, a townſhip in Ulſter county, New-York, on the weſt ſide of Hudſon's river, north of Newburgh. It contains 2,241 inhabitants; of whom 339 are electors, and 58 ſlaves.—*ib.*

Marlborough, the name of three townſhips in Pennſylvania, the one in Montgomery county, and Eaſt and Weſt Marlborough in Cheſter county.—*ib.*

Marlborough, *Lower*, a town of Maryland, ſituated in Calvert county on the eaſt ſide of Patuxent river, 24 miles ſouth-eaſt of Waſhington city. It contains about 60 houſes, and a ware-houſe for the inſpection of tobacco. The river is navigable for ſhips of burden for ſome miles above the town.—*ib.*

Marlborough, *Upper*, the chief town of Prince George's county, Maryland. It is ſituated on the ſouth-weſt ſide of Hatavifit, one of the two principal branches of Patuxent river. It contains about 120 houſes, a court-houſe, and a ware-houſe for the inſpection of tobacco. It is 47 miles S. S. W. of Baltimore, and about 15 eaſterly of the city of Waſhington.—*ib.*

MARLOW, a townſhip in Cheſhire county, New-Hampſhire, ſettled in 1761. It contains 313 inhabitants.—*ib.*

MARMOSETS, a harbour in the iſland of St Domingo, which may receive merchantmen, but the entrance of it is rendered difficult by the breakers. It lies between Cape Rouge and Grand Port Berhagne.—*ib.*

MARQUES, a cape on the coaſt of Old-Mexico, or New-Spain, in the South Sea.—*ib.*

MARSHFIELD, a townſhip in Plymouth county, Maſſachuſetts, bounded S. by Duxborough, and 36 miles S. E. of Boſton. It was incorporated in 1640, and contains 1269 inhabitants.—*ib.*

Marshfield, a townſhip in Caledonia county, in Vermont; adjoining to Calais on the N. W. and Peachum N. E.—*ib.*

MARSHPEE, by ſeveral writers called *Maſhpee*, an ancient Indian town in Barnſtable county, Maſſachuſetts, containing 308 inhabitants. There is ſtill an Indian church here, but not more than 40 or 50 perſons are pure Indians. The whole conſiſts of about 80 families, principally of a mixed race, being 280 ſouls in all. They have greatly decreaſed ſince 1693, when there were 214 adults, beſides ſtragglers in the plantation and places adjacent; under the care of Mr Rowland Cotton, miniſter of Sandwich.—*ib.*

MARSHY HOPE, the north-weſtern branch of Nanticoke river in Maryland. Federalſburgh lies on the E. ſide, 13 or 14 miles from its mouth.—*ib.*

MARTHA BRAE, in Jamaica a ſmall town having a harbour, 7 leagues W. of Montego Point. It is frequented only by ſuch veſſels as are particularly deſtined for this place. There is a bar with 16 or 17 feet water in going in; and the paſſage in coming out between the Triangle Rocks is not more than 60 feet wide with 6½ or 7 fathoms water.—*ib.*

MARTHA, *St*, a city in the province of the ſame name, in Terra-firma, South America, with a harbour on the N. Sea, at the mouth of the Guayra; about 124 miles N. E. of Carthagena. It is the reſidence of a governor and biſhop. The houſes are built with canes, and are very neat. Its harbour is large, convenient, and ſafe, and the environs agreeable and fertile. At preſent it contains about 3000 inhabitants, who carry on an extenſive rich trade, and make great quantities of cottons, ſtuffs, &c. with earthen ware, which is much eſteemed. It has a valuable pearl fiſhery, in which great numbers of ſlaves are employed, whoſe dexterity in diving for the oyſters is very extraordinary; ſome of whom will remain for a quarter of an hour under water, and will riſe with a baſket full. N. lat. 11° 26′, W. long. 73° 59′.—*ib.*

MARTHA'S VINEYARD, an iſland belonging to Duke's county, Maſſachuſetts, called by the Indians *Nope*, or *Capawock*, is ſituated between 40° 17′, and 41° 29′ N. lat. and between 70° 22′ and 70° 50′ W. long. about 21 miles long and 6 broad, and lies a little to the W. of Nantucket. Martha's Vineyard, Chabaquiddick, Noman's Iſland, and the Elizabeth Iſlands, which contain about 16,500 acres of valuable land, conſtitute Duke's county, containing 3,265 white inhabitants, and between 400 and 500 Indians and mulattoes; who ſubſiſt by agriculture and fiſhing. Cattle and ſheep are raiſed here in great numbers; and rye, corn and oats are the chief produce of the iſland. White pipe-clay, and yellow and red ochre are found in Martha's Vineyard. The ravages of war were ſeverely felt in this induſtrious ſpot. In September, 1778, the Britiſh made a requiſition of their militia arms, 300 oxen, and 2000 ſheep, which were delivered up.—*ib.*

MARTICK, a townſhip in Lancaſter county, Pennſylvania.—*ib.*

MARTIN, a county of Halifax diſtrict, N. Carolina, adjoining Tyrrel, Halifax, Bertie, and Pitt counties. It contains 6,080 inhabitants, of whom 1,889 are ſlaves.—*ib.*

MARTIN'S, *St*, one of the northernmoſt of the Caribbee iſlands; ſituated in the Atlantic ocean, between Anguilla on the north, from whence it is diſtant a league and a half, and St Bartholomew on the ſouth-eaſt, 15 miles. It is about 15 leagues in circumference, with commodious bays and roads on the N. W. ſide. Here are good ſalt-pits, and lakes of ſalt water, which run a great way within the land; but has no freſh water but what falls from the clouds, and is ſaved by the inhabitants in ciſterns. The ſalt lakes abound in good fiſh, particularly turtle; and the ſalt water pools are frequented by vaſt numbers of birds. In the woods are wild hogs, turtle-doves, and parrots innumerable. Here are ſeveral trees producing gums; and plenty of the candle-tree, ſplinters of which, when dry and lighted, emit a very fragrant ſmell. Its tobacco, the chief commodity cultivated, is reckoned the beſt in the Caribbee iſlands. The Spaniards abandoned this iſland in 1650, and blew up a fort which they had erected. The French and Dutch afterwards ſhared the iſland between them. But in 1689, were attacked and plundered by Sir Timothy Thornhill, and in July, 1744, were driven out by the Britiſh forces, and did not return till after the peace of 1763. They now enjoy about 35,000 acres, out of the 55,000 which the whole iſland contains. The two colonies breed poultry and ſheep, which they ſell to the other iſlands. They alſo cultivate a little cotton and coffee. About 20 years ago the French part contained 400 white families, and 10,000 ſlaves. The Dutch part no more than 60 families, and about 200 ſlaves. N. lat. 18° 6′, W. long. 62° 30′.—*ib.*

MARTINSBOROUGH, a town of N. Carolina, ſituated on the S. ſide of Tar river, and 20 miles above Waſhington.—*ib.*

MARTINSBURG, a poſt-town of Virginia, and capital of Berkeley county, ſituated about 8 miles ſouth of the Patowmac, in the midſt of a fertile and well cultivated country, and 25 miles from the mineral ſprings at Bath. It contains upwards of 70 houſes, a court-houſe, gaol, and Epiſcopal church; and contiguous to the town is one for Preſbyterians. It is 10 miles from Shepherdſtown, 30 from Pittſylvania court-houſe, 25 from Rocky Mount or Franklin court-houſe, 22 N. E. of Wincheſter, 88 N. N. W. of Alexandria, and 244 from Philadelphia.—*ib.*

MARTINVILLE, a poſt-town, and the capital of Guilford county, in N. Carolina, is agreeably ſituated on the eaſt ſide of Buffaloe creek, a branch of Haw river, and contains about 40 houſes, a court-houſe and gaol. It lies N. E. of Bell's Mill, at the head of Deep river; 48 miles north-weſt of Hillſborough; 27 eaſt of Salem; 50 north-eaſt of Saliſbury; 151 weſt by ſouth of Halifax, and 500 ſouth-weſt of Philadelphia. N. lat. 36° 5′, W. long. 79° 43′.

It was near this town that General Greene and Lord Cornwallis engaged in one of the beſt fought actions in the late war, on the 15th of March, 1781: and although the Americans were driven off the field, the Britiſh ſuffered ſo great loſs, that they could not purſue the victory. The greateſt part of the country in which the action happened, was a wilderneſs, with a few cleared fields interſperſed. The American army, when the action commenced, was poſted on a riſing ground about a mile and a half from Guilford court-houſe.—*ib.*

MARYLAND POINT, is formed by a bend in Patowmac river, W. of Port Tobacco.—*ib.*

MARY, *St*, a port on the ſouth ſide of the Bay of Fundy.—*ib.*

Mary, *Cape St*, is the moſt ſouthern promontory of Brazil, in South-America.—*ib.*

Mary, *Cape St*, the point of land which forms the northern ſide of the mouth of La Plata river in Paraguay or La Plata, in South-America. S. lat 35° 14′, W. long. 55° 32′.—*ib.*

Mary, *Cape St*, forms the ſoutheaſtern head land at the mouth of Placentia Bay, Newfoundland Iſland. —*ib.*

MARY'S RIVER, *St*, a branch of the Miami, which empties into Lake Erie.—*ib.*

Mary's River, *St*, forms a part of the ſouthern boundary line of the United States. It in part divides Georgia from Eaſt-Florida, and is very crooked, with a wide open marſh on each ſide, from its mouth upwards 30 miles, where the marſh is terminated by thick woods. It is nearly ſtraight for 30 miles farther, up to *Allen's*, an Indian trader at the head of navigation; where it is like a dead creek, 4 fathoms deep, and 10 rods wide. It riſes in the great Okafonoka or Ekanfanoga ſwamp, which extends ſouthwardly into Eaſt-Florida. It is thought to be what is called May river, diſcovered by John Ribalt, in 1562. Between this, and Naſſau river, lies the low even coaſt of Amelia Iſland. The harbours of both rivers are ſpacious, but St Mary's is the ſafeſt. It has 9 feet of water at low ſpring tides. It runs a courſe of 150 miles, and enters the ocean between the points of Amelia and Talbert's iſlands, in lat. 30° 44′ and is navigable for veſſels of conſiderable burden for 90 miles. Its banks afford immenſe quantities of fine timber, ſuited to the Weſt-India market. Along this river, every 4 or 5 miles, are bluffs convenient for veſſels to haul to and load.—*ib.*

Mary's, *St*, a poſt-town and port of entry of Georgia, ſituated on St Mary's river, a few miles from its mouth. It is a ſmall place, and has little trade. It is 129 miles ſouth of Savannah. N. lat. 30° 45′, W. long. 79° 12′.—*ib.*

Mary's, *St*, a county of Maryland on the peninſula between Patowmac and Patuxent rivers, 39 miles in length, and 15 in breadth. It contains 15,544 inhabitants; of whom 6,985 are ſlaves.—*ib.*

MASCOMY, a conſiderable pond in New-Hampſhire, in the ſouth-weſtern part of Grafton county, lying partly in Lebanon and partly in Enfield townſhips. This pond is from 30 to 40 fathoms deep. The ſurrounding land bears evident marks, that the ſurface of this pond was once 30 or 40 feet higher than its preſent level. By what cauſe the alteration was made, and at what time, is unknown; but appearances indicate a ſudden rupture, there being no ſign of any margin between its former and preſent height. About a mile diſtant from its outlet, there is a declivity of rocks, 40 feet higher than the ſtream, as it now runs. By the ſituation of theſe rocks, it appears that they were once a fall, over which the water flowed; but it has now made for itſelf a very deep channel, through ſolid earth, nearly a mile in length, where it ſeems confined for futurity.—*ib.*

MASCAUTENS, an Indian nation who inhabit on Lake Michigan, and between that and the Miſſiſſippi. The number of warriors, 400.—*ib.*

MASON (the Rev. William) was a man of ſuch eminence both as a poet and as a ſcholar, that a more particular account of his life and of his ſtudies ſhould be publiſhed than our ſcanty materials enable us to give. He was born at Hull, where his father poſſeſſed the vicarage of St Trinity; but where he received his ſchool education we have not been able to learn. At the proper time he was admitted into St John's College, Cambridge; where he took the degrees of B. A. and M. A. and in 1747, he obtained a fellowſhip in Pembroke Hall. It was there that he contracted an intimate friendſhip with Gray the poet, and with Mr Hurd, now Biſhop of Worceſter. When the former of theſe gentlemen died, Mr Maſon took upon himſelf the office of editor of his works and guardian of his fame; and upon the promotion of the latter to the ſee of Litchfield and Coventry, he expreſſed his ſatisfaction in ſome beautiful verſes, which we read at the time, but do not recollect where.

In 1754 he entered into holy orders, and was patronized by the then Earl of Holderneſs, who obtained for him the appointment of chaplain to the king, and preſented him with the valuable rectory of Aſton in Yorkſhire. He was ſome time afterwards made precentor of York Cathedral, when he publiſhed a ſmall volume of Church muſic, which has alternately met with oppoſition and applauſe. In our opinion ſome of his anthems are unrivalled.

It was natural for the precentor of a cathedral church, who was likewiſe a poet, to turn his attention to ſacred muſic; and Maſon had been a poet from his early years. His *Elfrida* and *Caractacus*, two tragedies on the Grecian model, were both publiſhed before the year 1757. Theſe two dramas, in the opinion of Dr Hurd, do honour to modern poetry, and are, according to him, a ſufficient proof of the propriety of reviving the chorus on the Britiſh ſtage. In this ſentiment few critics, we believe, will agree with his Lordſhip; but the tragedies have certainly great merit, and tranſcend perhaps every poem of the ſame caſt in our own or any other modern tongue. In the firſt, the language is elegant and ſweet; in the latter, it is daring and ſublime. The author himſelf always conſidered the former as the moſt perfect; and Johnſon, whoſe critical judgment will not be raſhly queſtioned, ſeems to have been of the ſame opinion. Johnſon's partiality to Oxford, as is well known, made him embrace every opportunity of turning into ridicule Cambridge men and Cambridge poems; but while he boaſted of having ſpent hours in burleſquing Caractacus for the amuſement of his Oxford friends, he confeſſed that Elfrida was too beautiful to be hurt by ridicule. The voice of the public, however, ſeems to give the preference to the latter, and to conſider it as ſtanding, like Dryden's celebrated ode, without a rival. In both are ſentiments and expreſſions which would do honour to the genius of Shakeſpeare; and Caractacus, in the Greek verſion of Mr Glaſs, would not have diſgraced an Athenian theatre.

Beſides his two tragedies, Mr Maſon publiſhed many other poems. His Engliſh Garden is univerſally read and admired, being unqueſtionably the fineſt poem of the kind that has appeared ſince the days of Thomſon; though ſome have affected to conſider it as treating the ſubject rather with profeſſional ſkill than with poetical genius. That there are in it a few proſaic expreſſions we ſhall not controvert; for ſuch ſeem inſeparable from didactic poetry; but, taken as a whole, where ſhall we find its equal? His elegies particularly that on the death of his wife, and that on the demiſe of Lady Coventry, have been generally read and extolled, though not more than they deſerve, as ſuperior in claſſic elegance to any thing of the kind in the Engliſh tongue, and expreſſing a manlineſs and tenderneſs of the pathetic, rarely found in the moſt poliſhed elegies of Roman writers. The ſplendor of genius, and accuracy of judgment, conſpicuous in his dramas, are equally diſplayed in his character as a lyric writer. His quarry was bold and impetuous, and he never ſwept the ground with an ignominious flight. In his Sappho and Phaon he has happily imitated the ſtyle of Dryden and Metaſtaſio; and at his death he was employed on a poem in which he propoſed to meaſure his ſtrength with Dryden.

We have reaſon to believe that this ingenious man was not only a poet and a muſical performer, but the inventor of the faſhionable inſtrument the Piano Forte. We cannot indeed at preſent bring evidence of this fact; but we have inſtituted ſuch inquiries as, we hope, ſhall enable us to aſcertain the truth under the article *Piano Forte*.

Poetry and muſic, and the duties of his office, might be ſuppoſed to have employed all his time; but, unfortunately, he caught the alarm which in 1769 was ſpread over the nation by the expulſion of Mr Wilkes from the Houſe of Commons, and immediately inrolled himſelf among the ſupporters of the *Bill of Rights*. The deciſion of the Houſe, which pronounced Mr Lutteral duly elected in oppoſition to Mr Wilkes, he conſidered as a groſs violation of the rights of the people; and though he ſurely did not approve of the conduct of the exiled member, he joined with other freeholders in Yorkſhire in a petition to the king that he would diſſolve the parliament.

Being now leagued with the oppoſition, he joined in ſome violent clamours for a parliamentary reform. In the year 1779, when the city of London, and ſome other commercial towns, agreed to preſent their petitions to parliament for a more economical expenditure of the public money, and a more equal repreſentation of the people, Mr Maſon came forward, and took an active part in promoting theſe deſigns, as one who was convinced of their importance and neceſſity. When the county of York aſſembled, on the 30th of December 1779, and reſolved unanimouſly, "that a committee of correſpondence ſhould be appointed, for the effectually promoting the object of the petition then agreed to, and alſo to prepare a plan of *aſſociation* to ſupport that laudable reform, and ſuch other meaſures as may conduce to reſtore the *freedom of parliament*," he was choſen upon the committee, and was conſulted with, or aſſiſted in drawing up thoſe various high-ſpirited reſolutions and addreſſes to the public, for which the Yorkſhire committee was ſo celebrated; and which was afterwards generally adopted by the other aſſociated bodies of reformers. This part of his conduct is ſurely entitled to no praiſe. Thinking as we do of the parliamentary reformers, we cannot but regret that a man of Mr Maſon's talents and virtues ſhould have embarked in their dangerous purſuits; and though we perceived leſs hazard in thoſe purſuits than we do, we ſhould ſtill conſider them as unſuitable to the character of a clergyman. Our author, however, was of a different opinion. In reply to a cenſure paſſed by a dignified clergyman on the political conduct of himſelf and ſome of his reverend brethren, he publiſhed, without his name indeed, a ſpirited defence of their proceedings and deſigns in ſome of the country papers. The York committee, too, at its next meeting, reſolved, "that a Proteſtant, by entering into holy orders, does not abandon his civil rights;" they alſo reſolved, "that the thanks of the committee be given to thoſe reverend gentlemen who, thus preferring the public good to their own private emoluments, have ſtood forth the firm friends to the true intereſts of their country."

Mr Maſon, however, ſhowed, by his ſubſequent conduct, that however earneſtly he might wiſh for what he doubtleſs conſidered as an expedient reform in the commons-houſe of Parliament, he was firmly attached to the Britiſh conſtitution. He was indeed a whig; but he was a whig of the old ſchool. In the beginning of 1794, when the reformers had betrayed the principles of French democrates, he deſerted them, and ranged himſelf under the banners of the ſervants of the crown; and for this conduct, which was certainly conſiſtent, he has been plentifully traduced by our Jacobin journaliſts as an alarmiſt, who not only deſerted his old friends, but aſcribed to them a certain degree of guilt and political depravity.

The death of this great and good man, which happened in April 1797, was occaſioned neither by age nor by inveterate diſeaſe. As he was ſtepping into his chariot, his foot ſlipped, and his ſhin grazed againſt the ſtep. This accident had taken place ſeveral days before he paid the proper attention to it; and on April the 3d a mortification enſued, which, in the ſpace of forty-eight hours, put a period to his life.

That he was a ſcholar and a poet of high eminence is univerſally acknowledged; and we are aſſured, that his poſthumous works, when publiſhed, will not detract from his living fame. In private life, though he affected perhaps too much the faſtidious manners of Mr Gray, whoſe genius he eſtimated with a degree of enthuſiaſm amounting almoſt to idolatry, his character was diſtinguiſhed by philanthropy and the moſt fervid friendſhips; and he may be conſidered as a man who merits to be ranked with the ableſt ſupporters of Britiſh liberty and Britiſh morals.

MASON, a county of Kentucky, on the ſouthern ſide of Ohio river. It contains 2,267 inhabitants, of whom 208 are ſlaves.—*Morse.*

MASON, a townſhip in Hillſborough county, New-Hampſhire, on the Maſſachuſetts line, about 70 miles weſt of Portſmouth, and 50 N. W. of Boſton. It was incorporated in 1768, and contains 922 inhabitants.—*ib.*

FREE-MASONRY, is a ſubject which, after the copious detail given in the *Encyclopædia* of its lodges, and wardens, and grand maſters, we ſhould not have reſumed in this place, but to warn our countrymen againſt the pernicious ſuperſtructures which have been raiſed by the French and Germans on the ſimple ſyſtem of Britiſh maſonry.

Much falſehood is current reſpecting the origin and antiquity of the maſonic aſſociations. That the Dionyſiacs of Aſia Minor were a ſociety of architects and engineers, who had the excluſive privilege of building temples, ſtadia, and theatres, under the myſterious tutelage of Bacchus, ſeems to be unqueſtionable. "We are alſo certain, that there was a ſimilar trading aſſociation during the dark ages in Chriſtian Europe, which monopolized the building of great churches and caſtles, and enjoyed many privileges under the patronage of the various ſovereigns. Circumſtances (ſays Dr Robiſon), which it would be tedious to enumerate and diſcuſs, continued this aſſociation longer in Britain than on the continent;" but there is no good evidence, that, anterior to the year 1648, any man ſought admiſſion into it, who was not either a builder by profeſſion, or at leaſt ſkilled in the ſcience of architecture. At that period, indeed, Mr Aſhmole, the famous antiquary (ſee ASHMOLE, *Encycl.*), was admitted into a lodge at Warrington, together with his father-in-law Colonel Mainwaring; and theſe are the firſt diſtinct and unequivocal inſtances that we have in Britain of men unconnected with the operative maſons being received into their myſterious fraternity. The ſecrecy, however, of the lodges, made them fit places for the meetings of the royaliſts; and accordingly many royaliſts became free-maſons. "Nay, the ritual of the maſter's degree ſeems to have been formed, or perhaps twiſted from its original inſtitution, ſo as to give an opportunity of ſounding the political principles of the candidate, and of the whole brethren preſent. For it bears ſo eaſy an adaption to the death of the king, to the overturning of the venerable conſtitution of the Engliſh government of three orders by a mean democracy, and its re-eſtabliſhment by the efforts of the loyaliſts, that this would ſtart into every perſon's mind during the ceremonial, and could hardly fail to ſhew, by the countenances and behaviour of the brethren, how they were affected."

This ſuppoſition receives much countenance from the well known fact, that "Charles II. was made a maſon, and frequented the lodges. It is not unlikely, that beſides the amuſement of a vacant hour, which was always agreeable to him, he had pleaſure in meeting with his loyal friends, and in the occupations of the lodge, which recalled to his mind their attachment and ſervices. His brother and ſucceſſor James II. was of a more ſerious and manly caſt of mind, and had little pleaſure in the frivolous ceremonies of maſonry. He did not frequent the lodges. But, by this time, they were the reſort of many perſons who were not of the profeſſion, or members of the trading corporation. This circumſtance, in all probability, produced the denominations of *free* and *accepted* maſons. A perſon who has the privilege of working at any incorporated trade, is ſaid to be a *freeman* of that trade. Others were *accepted* as brethren, and admitted to a kind of honorary freedom; as is the caſe in many other trades and incorporations, without having (as far as we can learn for certain) a legal title to earn a livelihood by the exerciſe of it."

It was not till ſome years after this period that the lodges made open profeſſion of the cultivation of general benevolence, and that the grand aim of the fraternity was to enforce the exerciſe of all the ſocial virtues. The eſtabliſhment of a fund for the relief of unfortunate brethren did not take place till the very end of the 17th century; and we may preſume, that it was brought about by the warm recommendations of ſome benevolent members, who would naturally enforce it by addreſſes to their aſſembled brethren. Hence the probable origin of thoſe philanthropic diſcourſes, which are occaſionally delivered in the lodges by one of the brethren as an official taſk.

The boaſted philanthropy of maſons ſerves, however, another purpoſe. The inquiſitive are always prying and teazing, eager to diſcover the ſecrets of their neighbours; and hence the brethren are induced to ſay, that univerſal beneficence is the great aim of the order, for it is the only point on which they are at liberty to ſpeak. They forget, that univerſal beneficence and philanthropy are inconſiſtent with the excluſive and monopolizing ſpirit of an aſſociation, which not only confines its benevolence to its own members (like any other charitable aſſociation), but hoards up in its boſom ineſtimable ſecrets, whoſe natural tendency, they ſay, is to form the heart to this generous and kind conduct, and inſpire us with love to all mankind. The profane world cannot ſee the beneficence of concealing from public view a principle or a motive which ſo powerfully induces a maſon to be good and kind. The brother ſays, that publicity would rob it of its force; and we muſt take him at his word: and our curioſity is ſo much the more excited, to learn what are the ſecrets which have ſo ſingular a quality, for they muſt be totally unlike the principles of ſcience, which produce their effects only when made public.

From this account of maſonry, it would appear to have been at firſt a loyal aſſociation, and as ſuch it was carried over from England to the continent; for all the maſons abroad profeſs to have received their myſteries from Great Britain. It was firſt tranſported into France by the zealous adherents of King James, who, together with their unfortunate maſter, took refuge in that country; and it was cultivated by the French in a manner ſuited to the taſte and habits of that highly poliſhed and frivolous people. To the three ſimple Britiſh degrees of *apprentice*, *fellow-craft*, and *maſter*, they gradually added degrees innumerable, all decorated with ſtars and ribbons; and into their lodges they introduced the impieties and ſeditious doctrines of Voltaire and the other philoſophiſts. Indeed, if the account which the Abbé Barruel gives of maſonry be juſt, it muſt be admitted, that even the ſecrets of the moſt ancient lodges, though in one ſenſe harmleſs and juſt, are ſo expreſſed, that they may be eaſily twiſted to very dangerous purpoſes. This author was advanced by a few friends to the degree of maſter, without being obliged to take the oath of ſecrecy; and being furniſhed with the ſigns, he got admiſſion into a lodge, where he heard the ſecret regularly communicated, with all the ordinary forms, to an apprentice. "It would be uſeleſs, ſays he, to deſcribe the ceremonials and trials on ſuch occaſions; for in the firſt degrees, they are nothing more than the play of children. The grand object was the communication of the famous ſecret, when the candidate was ordered to approach nearer to the venerable. At that moment, the brethren, who had been armed with ſwords for the occaſion, drawing up in two lines, held their ſwords elevated, leaning the points towards each other, and formed what in maſonry is called the *arch of ſteel*. The candidate paſſed under this arch to a ſort of altar elevated on two ſteps, at the fartheſt end of the lodge. The maſter, ſeated in an arm chair, or a ſort of throne, behind this altar, pronounced a long diſcourſe on the inviolability of the ſecret which was to be imparted, and on the danger of breaking the oath which the candidate was going to take. He pointed to the naked ſwords, which were always ready to pierce the breaſt of the traitor; and declared to him that it was impoſſible to eſcape their vengeance. The candidate then ſwore, "that rather than betray the ſecret, he conſented to have his head cut off, his heart and entrails torn out, and his aſhes caſt before the winds." Having taken the oath, the maſter ſaid the following words to him; "My dear brother, the ſecret of maſonry conſiſts in theſe words, EQUALITY AND LIBERTY; *all men are equal and free; all men are brethren*." The maſter did not utter another ſyllable, and every body embraced the new *brother equal and free*. The lodge broke up, and we gayly adjourned to a maſonic repaſt."

In the Britiſh lodges, the author admits, that no other interpretation is given to this famous ſecret, than that, as all men are children of one common parent, and creatures of the ſame God, they are in duty bound to love and help each other as brethren; but he contends, that in France it was differently interpreted; and he ſupports his opinion by the following arguments:

On the 12th of Auguſt 1792, Louis XVI. was carried a priſoner to the tower of the *temple*, ſo called becauſe it formerly belonged to the knights templars. On that day, the rebel aſſembly decreed, that to the date of *liberty* the date of *equality* ſhould be added in future in all public acts; and the decree itſelf was dated the fourth year of *liberty*, the firſt year and firſt day of *equality*. It was on that day, for the firſt time, that the ſecret of free-maſonry was made public; that ſecret ſo dear to them, and which they preſerved with all the ſolemnity of the moſt inviolable oath. At the reading of this famous decree, they exclaimed, "We have at length ſucceeded, and France is no other than an immenſe lodge. The whole French people are free maſons, and the whole univerſe will ſoon follow their example."

"I witneſſed (ſays our author) this enthuſiaſm; I heard the converſations to which it gave riſe; I ſaw maſons, till then the moſt reſerved, who freely and openly declared, 'Yes, at length the grand object of free-maſonry is accompliſhed, EQUALITY and LIBERTY; *all* *men are equal and brothers; all men are free.* That was the whole ſubſtance of our doctrine, the object of our wiſhes, *the whole of our grand ſecret!*”

This is a very ſerious charge againſt the original ſecret of maſonry, as it was underſtood in France; and though the author does not bring it directly againſt the ſame ſecret as underſtood in Britain, he yet ſeems to ſay, that in *all* lodges, the following queſtion is put to the candidate before he is entruſted with any ſecret:—“Brother, are you diſpoſed to execute all the orders of the grand-maſter, though you were to receive contrary orders from a king, an emperor, or any other ſovereign whatever?” And as the brother is obliged to promiſe this unlimited obedience, it is eaſy to conceive how much a traiterous conſpiracy may be promoted by means of maſon lodges. The allegorical ſtory which is told at the conferring of the degree of maſter, is capable of various and even contrary interpretations; for though in this country it was originally rendered ſubſervient to the purpoſes of the royaliſts, in the occult lodges on the continent it has been made the vehicle of treaſon and impiety.

When the degree of maſter-maſon is to be conferred, the lodge is hung round with black. In the middle is a coffin covered with a pall, the brethren ſtanding round it in attitudes denoting ſorrow and revenge. When the new adept is admitted, the maſter relates to him the following hiſtory or fable:

“Adoniram preſided over the payment of the workmen who were building the temple by Solomon's orders. They were three thouſand workmen. That each one might receive his due, Adoniram divided them into three claſſes, apprentices, fellow-crafts, and maſters. He entruſted each claſs with a word, ſigns, and a gripe, by which they might be recogniſed. Each claſs was to preſerve the greateſt ſecrecy as to theſe ſigns and words. Three of the fellow-crafts, wiſhing to know the word, and by that means obtain the ſalary, of maſter, hid themſelves in the temple, and each poſted himſelf at a different gate. At the uſual time when Adoniram came to ſhut the gates of the temple, the firſt of the three met him, and demanded the *word of the maſters;* Adoniram refuſed to give it, and received a violent blow with a ſtick on his head. He flies to another gate, is met, challenged, and treated in a ſimilar manner by the ſecond: flying to the third door, he is killed by the fellow-craft poſted there, on his refuſing to betray the word. His aſſaſſins buried him under a heap of rubbiſh, and marked the ſpot with a branch of acacia.

“Adoniram's abſence gave great uneaſineſs to Solomon and the maſters. He is ſought for every where: at length one of the maſters diſcovers the corpſe, and, taking it by the finger, the finger parted from the hand; he took it by the wriſt, and it parted from the arm; when the maſter, in aſtoniſhment, cried out, *Mac Benac;* which the craft interprets by “*the fleſh parts from the bones.*”

“Leſt Adoniram ſhould have revealed the *word*, the maſters convened and agreed to change it, and to ſubſtitute the words *Mac Benac;* ſacred words, that free-maſons dare not pronounce out of the lodges, and there each only pronounces one ſyllable, leaving his neighbour to pronounce the other.”

The hiſtory finiſhed, the adept is informed, that the object of the degree he has juſt received is to recover the word loſt by the death of Adoniram, and to revenge this martyr of the maſonic ſecrecy. The generality of maſons, looking upon this hiſtory as no more than a fable, and the ceremonies as puerile, give themſelves very little trouble to ſearch farther into theſe myſteries.

Theſe ſports, however, aſſume a more ſerious aſpect when we arrive at the degree of elect *(Elu.)* This degree is ſubdivided into two parts; the firſt has the revenging of Adoniram for its object, the other to recover the *word*, or rather the ſacred doctrine which it expreſſed, and which has been loſt.

In this degree of elect, all the brethren appear dreſſed in black, wearing a breaſt-piece on the left ſide, on which is embroidered a death's head, a bone, and a poignard, encircled by the motto of *Conquer or die.* The ſame motto is embroidered on a ribband which they wear in ſaltier. Every thing breathes death and revenge. The candidate is led into the lodge blindfolded, with bloody gloves on his hands. An adept with a poignard in his hand threatens to run him through the heart for the crime with which he is accuſed. After various frights, he obtains his life, on condition that he will revenge the father of maſonry in the death of his aſſaſſin. He is ſhewn to a dark cavern. He is to penetrate into it; and they call to him, Strike all that ſhall oppoſe you; enter, defend yourſelf, and avenge our maſter; at that price you ſhall receive the degree of elect. A poignard in his right hand, a lamp in his left, he proceeds; a phantom oppoſes his paſſage; he hears the ſame voice repeat, Strike, avenge Hiram, there is his aſſaſſin. He ſtrikes, and the blood flows.—Strike off his head, the voice repeats; and the head of the corpſe is lying at his feet. He ſeizes it by the hair (A), and triumphantly carries it back as a proof of his victory; ſhows it to each of the brethren, and is judged worthy of the new degree.

Our author ſays, that he has queſtioned divers maſons whether this apprenticeſhip to ferocity and murder had never given them the idea, that the head to be cut off was that of kings; but they all affirmed that ſuch an idea had never occurred to them till the French revolution had convinced them of the fact. At this indeed we are not ſurpriſed. The aſſaſſin of Hiram is no where ſaid to have been a king; and why ſhould the young elect have ſuppoſed, that when ſtabbing that aſſaſſin, he was training to be a regicide? The ceremony, however, is certainly ferocious in the higheſt degree, and obviouſly calculated to reconcile the maſons of the occult lodges to the practice of aſſaſſination at the command of their ſuperiors; and when it is remembered, that they are bound to pay obedience to thoſe unſeen ſuperiors even againſt their lawful ſovereigns, the atrocities of the revolution would naturally make them interpret this ſhocking ceremony as it is interpreted by the Abbé.

It was the ſame with reſpect to the religious part of this degree, where the adept is at once pontiff and ſa-

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(A) The reader may eaſily conceive that this corpſe is no more than a mannikin containing bladders full of blood.

crificer with the reſt of the brethren. Veſted in the ornaments of the prieſthood, they offer bread and wine, according to the order of Melchiſedec. The ſecret object of this ceremony is to re-eſtabliſh religious equality, and to exhibit all men equally prieſts and pontiffs, to recal the brethren to natural religion, and to perſuade them that the religion of Moſes and of Chriſt had violated religious equality and liberty by the diſtinction of prieſts and laity. It was the revolution again which opened the eyes of many of the adepts, who then owned that they had been dupes to this impiety, as they had been to the regicide eſſay in the former part.

Our author treats the fraternity of the occult lodges through the higher degrees of Scotch maſonry, thoſe of the Roſicrucians, and that of the knights Kadoſch; and ſums up his account in the following terms:

" In the two firſt degrees, that is to ſay, in thoſe of *apprentice* and *fellow craft*, the ſect begins by throwing out its equality and liberty. After that, it occupies the attention of its novices with puerile games of fraternity or maſonic repaſts; but it already trains its adepts to the profoundeſt ſecrecy by the moſt frightful oaths.

" In that of *maſter*, it relates the allegorical hiſtory of Adoniram, who is to be avenged; and of the *word*, which is to be recovered.

" In the degree of *elect*, it trains the adepts to vengeance, without pointing out the perſon on whom it is to fall. It carries them back to the time of the patriarchs, when, according to them, men knew no religion but that of nature, and when every body was equally prieſt and pontiff. But it had not as yet declared that all religion revealed ſince the time of the patriarchs was to be thrown aſide.

" This laſt myſtery is only developed in the Scotch degrees. There the brethren are declared free: The word ſo long ſought for is, Deiſm; it is the worſhip of Jehovah, ſuch as was known to the philoſophers of nature. The true maſon becomes the pontiff of Jehovah; and ſuch is the grand myſtery by which he is extricated from that darkneſs in which the prophane are involved.

" In the degree *Roſæ Crucis*, he who wreſted the *word*, who deſtroyed the worſhip of Jehovah, is Chriſt himſelf, the author of Chriſtianity; and it is on the Goſpel and on the Son of Man that the adept is to avenge the brethren, the pontiffs of Jehovah.

" At length, on his reception as Kadoſch, he learns that the aſſaſſin of Adoniram is the king, who is to be killed to avenge the grand maſter Molay, and the order of the maſons ſucceſſors of the knights templars. The religion which is to be deſtroyed to recover the *word*, or the true doctrine, is the religion of Chriſt, founded on revelation. This word in its full extent is *equality* and *liberty*, to be eſtabliſhed by the total overthrow of the altar and the throne.

" Such are the incipient degrees, the proceſs, and the whole ſyſtem of maſonry; it is thus that the ſect, by its gradual explanation of its twofold principle of *equality* and *liberty*, of its allegory of the founder of maſonry to be avenged, of the word to be recovered, leading the adepts from ſecret to ſecret, at length initiates them into the whole Jacobinical code of revolution."

If this account of maſonry be not greatly exaggerated, what are we to think of thoſe men among ourſelves, who, ſince the publication of the Abbé Barruel's book and Dr Robiſon's, have diſplayed a zeal for the propagation of their myſteries, by which they ſeemed not to be formerly actuated, and to which the importance of the buſineſs that, by their own account, is tranſacted in the lodges, cannot be thought to bear an adequate proportion? It is not enough to ſay that Britiſh maſonry is harmleſs, and that the *equality* and *liberty* taught in our lodges are the equality and liberty taught in the bible. Without directly queſtioning this aſſertion, we only beg leave to put our countrymen in remembrance, that French and German maſonry, as it was derived from Britain, muſt have been originally as harmleſs as our own; and to call their attention to the monſtrous ſuperſtructures of impiety and rebellion which in theſe countries have been raiſed upon our foundation. Have there been no ſymptoms of ſedition and irreligion among us, ſince the commencement of the French revolution, that we ſhould be ſo confident that the equality and liberty of our lodges will never degenerate into the equality and liberty of the French Jacobins? This cannot be ſaid; for it has been proved, that there are ſeveral occult lodges in Britain; and what ſecurity have we, or what ſecurity can we receive, that their number will not increaſe? The legiſlature indeed has lately laid ſome ſalutary reſtraints on the meetings of maſons; but ſuch is the nature of theſe meetings, that nothing can effectually ſecure us againſt the introduction of the higher myſteries, but the voluntary ſhutting up for a time of all lodges. This has been done by the honeſt maſons in Germany; and why may it not be done by the maſons in Britain? The fund for the relief of poor brethren may ſurely be managed without ſecrecy; the ſigns and gripe may be communicated without the *word*, or exacting a promiſe of implicit obedience; and the relinquiſhing of the joys of a ſocial hour would be no great ſacrifice to the peace of a country.

But is Britiſh maſonry really ſo harmleſs as the younger maſons wiſh us to believe? The writer of theſe reflections was never initiated in its myſteries, and therefore cannot, from his own knowledge, ſay what is their tendency; but he has no heſitation to affirm, becauſe he believes himſelf able to demonſtrate, that it is groſsly immoral to promiſe implicit obedience to unknown ſuperiors, or to ſwear that one will keep inviolate a ſecret, to the nature of which he is an abſolute ſtranger. He hopes, indeed, and is inclined to believe, that, in the decent lodges of Britain, the candidate is aſſured, before he is required to take the oath, that the ſecret to be communicated, and the obedience which he is to pay, militate in no reſpect againſt the civil government or the religion of his country; but ſtill if the ſecret contain information of value, it is, in his opinion, ſinful to keep it a ſecret; and he cannot conceive upon what principle a native of Britain can promiſe unlimited obedience to any human being. The myſteries of maſonry muſt relate to ſomething which is either important and laudable; frivolous, though innocent; or dangerous and immoral. To confine to a ſect any information which is laudable and important, is ſurely not to act the part of genuine philanthropiſts; to adminiſter the moſt tremendous oaths in the midſt of frivolous amuſements, is to violate one of the moſt ſacred precepts of our holy religion; and, as no man will pretend to vindicate dangerous and immoral myſteries, maſonry appears, in every point in which it can be placed, an aſſociation which no good Chriſtian will think himſelf at liberty to encourage.

MASQUE PACONA, a juriſdiction of Charcas, in Peru, extending above 30 leagues. Its air is hot, but not too great for vines. The city of the ſame name, where the biſhop of Santa Cruz de la Sierra reſides, is very thinly inhabited; but there are in other parts of the juriſdiction, ſeveral populous towns. It produces all kinds of grain and fruits; honey and wax conſtitute a principal part of its trade.—*Morſe.*

MASQUES, or *Chilques* and *Maſques*, a juriſdiction of Caſco, in Peru, which begins about 7 or 8 leagues from Caſco, extending about 30 in length.—*ib.*

MASSAC, a fort built by the French, on the northweſtern ſide of the Ohio, about 11 miles below the mouth of Tenneſſee river. Its remains ſtand on a high bank, in a healthy agreeable ſituation.—*ib.*

MASSACHUSETTS, *Fort*, ſtands on the northweſtern corner of the State of its name, in N. lat. 42° 41′ 30″; 19 miles N. E. by N. of Pittsfield, and 20 due E. of Lanſingburgh city, in New-York State.—*ib.*

Massachusetts *Sound*, on the N. W. coaſt of North-America, is ſituated on the ſouthern ſide of the Quadras Iſles, and leads from the W. into Nootka Sound along the N. ſide of Kendrick's Iſland, whoſe eaſtern ſide forms, with Point Breakfaſt, the mouth of Nootka Sound.—*ib.*

MASSACRE *River* paſſes out of the Straits of Magellan S. W. into the ſuppoſed channel of St Barbara, which cuts through the iſland of Terra del Fuego, through which, we are informed, Capt. Mareanille of Marſeilles paſſed in 1713 into the South Pacific Ocean.—*ib.*

Massacre *River*, on the N. ſide of the Iſland of St Domingo, falls into the bay of *Mancenilla.*—*ib.*

Massacre, a ſmall iſland on the coaſt of Weſt-Florida, 2 miles to the eaſtward of Horn Iſland; 10 miles from the main land, all the way acroſs there is from 2 to 3 fathoms; except the ſhoal called La Grand Bature, which ſtretches a league from the main land, with 2 or 3 feet water on it, and in ſome places not ſo much. Behind it is a large bay called L'Ance de la Grand Bature, 8 miles E. of Paſcagoula bluff.—*ib.*

MASSAFUERO, an iſland in the S. Pacific Ocean, called by the Spaniards the Leſſer Juan Fernandes, 22 leagues W. by S. of the Greater Juan Fernandes. It has always been repreſented by the Spaniards as a barren rock, without wood, water or proviſions. But Lord Anſon found this to be a political falſity, aſſerted to prevent hoſtile veſſels from touching there. There is anchorage on the N. ſide in deep water, where a ſingle ſhip may be ſheltered cloſe under the ſhore, but is expoſed to all winds except the ſouth. According to Capt. Magee of the ſhip Jefferſon, it is 38 leagues to the weſtward of Juan Fernandes, and in about 33° 30′ S. lat. and 82° W. long. from Greenwich.—*ib.*

MASSANUTEN'S *River*, a weſtern branch of the Shenandoah.—*ib.*

MASSEDAN *Bay*, on the N. Pacific Ocean, and W. coaſt of Mexico, is ſituated between Acapulco and Aquacara, a port near the cape of California, where Sir Thomas Cavendiſh lay after he had paſſed the Straits of Magellan.—*ib.*

MASEY'S-TOWN, in the N. W. Territory, ſtands on the northern bank of Ohio river, between the rivers Little Miami and Sciota.—*ib.*

MASSY'S CROSS ROADS, in Kent county, Maryland, is N. E. of New Market, S. E. of George-Town, and S. by W. of Saſſafras-Town, a little more than 5 miles from each.—*ib.*

MAST *Bay*, on the north ſide of the iſland of Jamaica, in the N. W. part. It is eaſtward of Montego Bay, and near the ſhelf of rocks that lies from the ſhore, called Catlin's Cliffs.—*ib.*

MASTICK *Gut*, on the S. W. ſide of the iſland of St Chriſtopher's in the Weſt-Indies, is between Moline's Gut on the N. W. and Godwin's Gut on the ſouth-eaſt.—*ib.*

MASTIGON, a river which runs weſtward into lake Michigan about 11 miles north of La Grande Riviere. It is 150 yards wide at its mouth.—*ib.*

MASUAH (See Massuah, *Encycl.*) is in latitude 15° 35′ 5″ north, and in longitude 39° 36′ 30″ eaſt of Greenwich. On the 22d of September 1769 Mr Bruce found the variation of the needle at Maſuah to be 12° 48′ weſt.

MATA, *Point*, on the northern ſide of the iſland of Cuba, and 9 leagues N. W. of Cape Maiſy.—*Morſe.*

MATACA, or *Mantaca*, is a commodious bay on the N. coaſt of the iſland of Cuba, where the galleons uſually come to take in freſh water on their return to Spain, about 12 leagues from the Havannah. It appears to be the ſame as Matanze, in lat. 23° 12′ N. long. 81° 16′ W. Peter Heyn took a great part of a rich fleet of Spaniſh galleons here in 1627.—*ib.*

MATAIA, a province of S. America, towards the river Amazon, between the mouth of Madeira and Tapaiſa rivers.—*ib.*

MATANCA, or *Manances*, a ſhort and broad river of E. Florida which falls into the ocean ſouth of St Auguſtine.—*ib.*

MATANCHEL, a ſea-port on the weſt coaſt of New Mexico, about 20 leagues to the N. E. of the rocks of Ponteque, over which, in clear weather, may be ſeen a very high hill, with a break on the top, called the hill of Xaliſco, and may be ſeen 8 or 9 leagues from the port.—*ib.*

MATANE, a river of Canada, in N. America, the mouth of which is capable of admitting veſſels of 200 tons burden. All this coaſt, eſpecially near this river, for 20 leagues, abounds in cod, which might employ 500 ſhallops or fiſhing ſmacks at a time. The fiſh is very fine, and fit for exportation to the Straits, Spain, and the Levant. Great numbers of whales have been alſo ſeen floating upon the water, which may be ſtruck with a harpoon, and prove a very valuable fiſhery.—*ib.*

MATANZAS, or *Matance*, a large bay on the north ſide of the iſland of Cuba, 14 leagues ſouth-eaſt of the Havannah, but ſome accounts ſay 20 leagues. From Cape Quibanico to this bay the coaſt is weſt-north-weſt.—*ib.*

MATAVIA *Bay*, or *Port Royal Bay*, is ſituated within Point Venus near the north part of the iſland of Otaheite, but open to the north-weſt, and in the ſouth Pacific Ocean. The eaſt ſide of the bay has good anchorage in 14 and 16 fathoms. S. lat 17° 29′, W. long. 149° 30′, and the variation of the compaſs 3° 34′ eaſt.—*ib.*

MATCHADOCK *Bay*, in the eaſternmoſt part of Lake Huron.—*ib.*

MATHANON *Port*, in the ſouth-eaſt part of the iſland of Cuba, is one of thoſe ports on that coaſt which afford good anchorage for ſhips, but without any uſe for want of them. It is between Cape Cruz and Cape Maizi, at the eaſt end of the iſland. —*ib*

MATHEWS, *Fort*, ſtands on the eaſtern ſide of Oconee river, in the S. weſtern part of Franklin county, Georgia.—*ib.*

MATHEWS, a county of Virginia, bounded W. by Glouceſter, from which it was taken ſince 1790; lying on the W. ſhore of the bay of Cheſapeak. It is about 18 miles in length and 6 in breadth.—*ib.*

MATICALOC *River*, on the W. coaſt of New Mexico, is 7 leagues from Catalta Strand, or the port of Sanſonate. It is much expoſed to northerly winds, and is known by ſome ſmall but high hills that are oppoſite to it. There is another large river to the weſtward of it, about 4 leagues, which has 2 fathoms upon the bar; and from thence to the bar of Eſtapa it is 15 leagues.—*ib.*

MATILDA, a village of Virginia ſituated on the ſouth-weſt bank of Patowmac river, above Waſhington city, and near the Great Falls.—*ib.*

MATINICUS *Iſlands*, on the coaſt of Maine. When you paſs to the weſt of theſe iſlands, the main paſſage from the ſea to Penobſcot Bay lies about north by weſt. Matinicus lies north lat. 43° 56′, weſt long. 68° 20′.—*ib.*

MATMAI, or MATSUMAI, is the largeſt of the Kurile iſlands; and if it be not independent, is tributary to Japan. The capital town of the ſame name, Matmai, is ſituated on the ſea-ſhore, on the ſouth-weſt ſide. It was built and is inhabited by the Japaneſe. It is a fortified place, furniſhed with artillery, and defended by a numerous garriſon. The iſland of Matmai is the place of exile for perſons of diſtinction at Japan: it is ſeparated from that empire by only a narrow channel, but which is conſidered as dangerous, becauſe the capes, which project on both ſides, render the navigation difficult. The people are ſaid to be ſenſible to friendſhip, hoſpitable, generous, and humane.

MATTA DE BRAZIL, a town in the captainſhip of Pernambuco, in Brazil; about 9 leagues from Olinda. It is very populous; and quantities of Brazil are ſent from this country to Europe.—*Morſe.*

MATTAPONY, a navigable river of Virginia, which riſes in Spottſylvania county, and running a S. E. courſe, joins Pamunky river, below the town of De la War, and together form York river. This river will admit loaded floats to Downer's bridge, 70 miles above its mouth.—*ib.*

MATTES, on the eaſt coaſt of South-America, in the ſouth Atlantic Ocean, is in lat. 45° 5′ ſouth, and long. 64° 25′ weſt.—*ib.*

MATTHEO *Iſland, St*, or *St Matthew's Iſland*, in the S. Atlantic Ocean. S. lat 1° 24′.—*ib.*

MATTHEW'S *Bay, St*, in the Gulf of Mexico, on the W. ſhore of Campeachy Gulf, is more than 100 leagues to the N. of Tumbez.—*ib.*

MATTHEWS, *St*, or *Mattheo Bay*, on the coaſt of Peru, on the N. Pacific Ocean, is 6 leagues to the N. E. by E. from Point Galera, and 5 or 6 leagues S. S. W. from the river St Jago, between which there is anchorange all the way, if ſhips keep at leaſt in 6 fathoms water. It is all high land with hollow red crags, and ſeveral points run out, forming good retreats for ſhips driven in by hard ſqualls and flaws from the hills, and by the ſeas running high, which often happen.—*ib.*

MAUGERVILLE, a townſhip in Sunbury county, province of New Brunſwick, ſituated on St John's river, oppoſite St Annes, and 30 miles above Beliſle.—*ib.*

MAUREPAS, an iſland on the north-eaſt coaſt of Lake Superior, and north-eaſt of Ponchartrain iſland.—*ib.*

MAUREPAS, a lake in W. Florida, which communicates weſtward with Miſſiſſippi river, through the Gut of Ibberville, and eaſtward with Lake Ponchartrain. It is 10 miles long, 7 broad, and has 10 or 12 feet water in it. The country round it is low, and covered with cypreſs, live-oak, myrtle, &c. Two creeks fall into this lake, one from the north ſide, called Nattabanie, the other from the peninſula of Orleans. From the Ibberville at its junction with Maurepas to the river Amit is 39 miles, and from thence, following the Ibberville, to the Miſſiſſippi at the W. ſide of the peninſula of Orleans, 21 miles. From the Ibberville acroſs the lake, it is 7 miles to the paſſage leading to Ponchartrain. The length of this paſſage is 7 miles, and only 300 yards in width, which is divided into two branches by an iſland that extends from Maurepas to about the diſtance of a mile from Ponchartrain. The ſouth channel is the deepeſt and ſhorteſt. The paſſage thence through Lake Ponchartrain, to the Gulf of Mexico, is above 50 miles.—*ib.*

MAUREPAS *Iſland*, on the coaſt of Cape Breton, the ſame as the *Iſle Madame*.—*ib.*

MAURICE *Bay*, on the W. ſide of Cape Farewell Iſland, or S. extremity of E. Greenland, and the principal harbour of that ſea—*ib.*

MAURICE, *Port*, on the E. coaſt of Terra del Fuego Iſland, is on the W. ſhore of Le Maire Straits, between that iſland and Staten Land on the E. and N. of the bay of Good Succeſs. It is a ſmall cove, having anchorage before it in 12½ fathoms, about half a mile from the ſhore, over coral rocks.—*ib.*

MAURICE *River*, the name of a place in Cumberland county, New-Jerſey.—*ib.*

MAURICE *River*, in ſome maps called corruptly *Morris*, riſes in Glouceſter county, New-Jerſey, and runs ſouthwardly about 40 miles, and empties into Delaware Bay; is navigable for veſſels of 100 tons 20 miles, and for ſmall craft conſiderably further.—*ib.*

MAXANTALLA *Iſland*, is near the port of Matanchel on the W. coaſt of New-Mexico, and on the North Pacific ocean.—*ib.*

MAY, *Cape*, the moſt ſoutherly point of land of the State of New-Jerſey, and the N. point of the entrance into Delaware Bay and river, in lat. 39°, and long. 74° 56′ W. The time of high water on ſpring tide days, is a quarter before nine o'clock.—*ib.*

MAY POINT, on the S. ſide of New-Foundland Iſland, a point of the peninſula between Fortune and Placentia Bays.—*ib.*

MAYAGUANA, one of the Bahama iſlands in the Weſt-Indies, and the ſame with Maranella, and in lat. 22° 51′ N. at the N. point, and long. 72° 57′ W.—*ib.*

MAYFIELD, a townſhip in Montgomery county, New-York, adjoining Broadabin on the weſtward, taken from Caughnawaga, and incorporated in 1793. In 1796, 126 of its inhabitants were qualified electors.—*ib.*

MAY's *Lick*, in Maſon county, Kentucky, a ſalt ſpring on a branch of Licking river, 9 miles S. S. W. of Waſhington, on the ſouth bank of the Ohio, and 15 northerly of the Blue Licks.—*ib.*

MAYNAS, a government, formerly the eaſtern limit of the juriſdiction of Quito in Peru, and joining on the eaſt to the governments of Quixos and Jaen de Bracamoros. In its territory are the ſources of thoſe rivers which, after traverſing a vaſt extent, form, by their confluence, the famous river of the Amazons. It is ſeparated from the poſſeſſions of the Portugueſe, by the famous line of demarcation, or the boundary of thoſe countries belonging to Spain and Portugal. Its capital is San Franciſco de Borja, the reſidence of the governor, but the Superior reſides at Santiago de la Laguna. There are ſeveral miſſions in the government of Maynas, and dioceſe of Quito, particularly 12 on the river Napo, and 24 on the Maranon or Amazon; many of them are both large and populous.—*ib.*

MAYO *River*, on the eaſt ſhore of the Gulf of California, and weſt coaſt of New-Biſcay, in the province of that name, forms a ſpacious bay at its mouth, in lat. 27° 40′ N. and long. 114° W.—*ib.*

MAYORGA (Martin de). See *Don Martin*, &c. in this *Suppl.*

MAYOW (John), whoſe diſcoveries in chemiſtry have aſtoniſhed the ſcientific part of the public, deſcended, ſays Wood, from a genteel family living at *Bree* in the county of *Cornwall*. His father was probably a younger ſon, bred to buſineſs; for our author was born in Fleet-ſtreet, London, in the pariſh of St Dunſtan's in the Weſt. At what ſchool he received the rudiments of his education, a circumſtance which the biographers of men eminent in the republic of letters ſhould never omit, we have not been able to learn; but on the 27th of September 1661, when he had juſt completed his 16th year, he was admitted a ſcholar of Wadham college, Oxford. Some time afterwards, on the recommendation of Henry Coventry, Eſq; one of the ſecretaries of ſtate, he was choſen probationer fellow of All-ſouls college. As Wood informs us that he had here a *Legiſt's place*, an expreſſion by which we underſtand a law-fellowſhip, it is not wonderful that he took his degrees in the civil law, though phyſic and the phyſical ſciences were the favourite objects of his ſtudy. He was indeed an eminent phyſician, practiſing both in London and in Bath, but in the latter city chiefly in the ſummer months, till the year 1679, when he died, ſome time during the month of September, in the houſe of an apothecary in York-ſtreet, Covent Garden, and was buried in the church of that pariſh. He had been married, ſays Wood, a little before his death, not altogether to his content; and indeed he muſt have been very diſcontented, if he choſe to die in the houſe of a friend rather than in his own. He publiſhed, "Tractatus quinque medico phyſici, 1. De ſalnitro; 2. De reſpiratione; 3. De reſpiratione fœtus in utero et ovo; 4. De motu muſculari et ſpiritibus animalibus; 5. De Rachitide." Theſe were publiſhed together in 8vo at Oxford, in 1674; but there is an edition of two of them, "De reſpiratione," and "De Rachitide," publiſhed together at Leyden in 1671.

The fame of this author has been lately revived and extended by Dr Beddoes, who publiſhed, in 1790, "Chemical Experiments and Opinions, extracted from a work publiſhed in the laſt century," 8vo; in which he gives to Mayow the higheſt credit as a chemiſt, and aſcribes to him ſome of the greateſt modern diſcoveries reſpecting air, giving many extracts from the three firſt of his treatiſes. His chief diſcovery was, that oxygen gas, to which he gave the name of *fire air*, exiſts in the nitrous acid, and in the atmoſphere; which he proved by ſuch deciſive experiments, as to render it impoſſible to explain how Boyle and Hales could avoid availing themſelves, in their reſearches into air, of ſo capital a diſcovery. Mayow alſo relates his manner of paſſing aeriform fluids under water, from veſſel to veſſel, which is generally believed to be a new art. He did not collect dephlogiſticated air in veſſels, and transfer it from one jar to another, but he proved its exiſtence by finding ſubſtances that would burn in vacuo, and in water when mixed with nitre; and after animals had breathed and died in veſſels filled with atmoſpheric air, or after fire had been extinguiſhed in them, there was a reſiduum which was the part of the air unfit for reſpiration, and for ſupporting fire; and he further ſhewed, that nitrous acid cannot be formed, but by expoſing the ſubſtances that generate it to the atmoſphere. Mayow was undoubtedly no common man, eſpecially ſince, if the above dates are right, he was only 34 at the time of his death. But he was not ſo unknown as Dr Beddoes ſuppoſed; for ſince the repetition of the ſame diſcovery by Prieſtley and Scheele, reference has frequently been made by Chemiſts to Mayow as the original inventor; thus allowing to him a ſpecies of merit, to which he has perhaps but a doubtful claim, and which, if that claim be well founded, muſt certainly be ſhared between him and Dr Hooke. See HOOKE in this *Supplement*.

MAYZI, the eaſtern cape of the iſland of Cuba, and the weſtern point of the windward paſſage. N. lat. 20° 19′ 30″, W. long. from Paris 76° 40′ 30″.—*Morſe.*

MAZALTAN, a province of Mexico, or New Spain. It is well watered by the Alvarado, which diſcharges itſelf by 3 navigable mouths, at 30 miles diſtance from Vera Cruz.—*ib.*

MEADOWS, a ſmall river which falls into Caſco Bay, in the Diſtrict of Maine.—*ib.*

MEADS, a place ſituated on a fork of French Creek; a branch of the Alleghany, in Pennſylvania. N. lat. 41° 36′, and about 23 miles N. W. of Fort Franklin, at the mouth of the creek.—*ib.*

MEAN, in general. See *Encycl.*

Arithmetical MEAN, is half the ſum of the extremes. So 4 is an arithmetical mean between 2 and 6, or between 3 and 5, or between 1 and 7; alſo an arithmetical mean between a and b is $\frac{a+b}{2}$, or $\frac{1}{2}a + \frac{1}{2}b$.

Geometrical MEAN, commonly called a mean proportional, is the ſquare root of the product of the two extremes; ſo that, to find a mean proportional between two given extremes, multiply theſe together, and extract the ſquare root of the product. Thus, a mean proportional between 1 and 9, is $\sqrt{1\times 9}=\sqrt{9}=3$; a mean between 2 and $4\frac{1}{2}$ is $\sqrt{2\times 4\frac{1}{2}}=\sqrt{9}=3$ alſo; the mean between 4 and 6 is $\sqrt{4\times 6}=\sqrt{24}$; and the mean between a and b is $\sqrt{ab}$.

Harmonical Mean. See *Harmonical Proportion*, Encycl.

Mean and Extreme Proportion, or *Extreme and Mean Proportion*, is when a line or any quantity is ſo divided that the leſs part is to the greater, as the greater is to the whole.

Mean Anomaly of a Planet, is an angle which is always proportional to the time of the planet's motion from the aphelion or perihelion, or proportional to the area deſcribed by the radius vector; that is, as the whole periodic time in one revolution of the planet, is to the time paſt the aphelion or perihelion, ſo is 360° to the mean anomaly. See Anomaly, *Encycl.*

Mean Conjunction or *Oppoſition*, is when the mean place of the ſun is in conjunction, or oppoſition, with the mean place of the moon in the ecliptic.

Mean Diſtance of a Planet from the Sun, is an arithmetical mean between the planet's greateſt and leaſt diſtances.

Mean Motion, is that by which a planet is ſuppoſed to move equably in its orbit; and it is always proportional to the time.

Mean Time, or *Equal Time*, is that which is meaſured by an equable motion, as a clock; as diſtinguiſhed from apparent time, ariſing from the unequal motion of the earth or ſun.

Universal or Perpetual MEASURE, is a kind of meaſure unalterable by time or place, to which the meaſures of different ages and nations might be reduced, and by which they may be compared and eſtimated. Such a meaſure would be very uſeful if it could be attained; ſince, being uſed at all times, and in all places, a great deal of confuſion and error would be avoided.

It has been attempted, at different times and in different countries, more eſpecially by the French, who, ſince the commencement of their revolutionary government, have laboured hard to obtrude their innovations in arts and ſcience, as well as in politics, upon all nations. Propoſals, however, have been made by ſoberer men for a ſtandard both of weights and of meaſures for all nations: and ſome of the moſt rational of theſe ſhal be noticed under the word Weights in this *Supplement.*

MECATINA, *Great, Point of*, on the ſouth coaſt of Labrador, and the north ſhore of the Gulf of St Lawrence, in N. America. N. lat. 50° 42′, W. long. 59° 13′.—*Morse.*

MECATINA *Iſland, Little*, on the ſame coaſt and ſhore, lies ſouth-weſt of Great Mecatina. N. lat. 50° 36′.—*ib.*

MECHANICS.—Our readers will recollect that in the article Physics, *Encycl.* we propoſed to diſtinguiſh by the term *Mechanical Philoſophy* that part of natural ſcience which treats of the local motions of bodies and the cauſes of thoſe phenomena. And, although all the changes which we obſerve in material nature are accompanied by local motion, and, when completely explained, are the effects (perhaps very remote) of thoſe powers of matter which we call *moving forces*, and of thoſe alone, yet, in many caſes, this local motion is not obſerved, and we only perceive certain ultimate reſults of thoſe changes of place. This is the caſe (for example) in the ſolution of a grain of ſilver in a phial of aquafortis. In the beginning of the experiment, the particles of ſilver are contained in a ſmall ſpace at the bottom of the phial; but they are finally raiſed from the bottom, and uniformly diſſeminated over the whole fluid. If we fix our attention ſteadily on one particle, and trace it in its whole progreſs, we contemplate nothing but a particle of matter acted on by moving forces, and yielding to their action. Could we ſtate, for every ſituation of the particle, the direction and intenſity of the moving force by which it is impelled, we could conſtruct a figure, or a formula, which would tell us the preciſe direction and velocity with which it changes its place, and we could delineate its path, and tell the time when it will arrive at that part of the veſſel where it finally reſts in perfect equilibrium. Newton having done all this in the caſe of bodies acted on by the moving force called gravity, has given us a complete ſyſtem of mechanical aſtronomy. The philoſopher who ſhall be as fortunate in aſcertaining the paths and motions of the particles of ſilver, till the end of this experiment, will eſtabliſh a ſyſtem of the mechanical ſolution of ſilver in aquafortis; and the theorems and formulæ which characteriſe this particular moving force, or this modification of force, ſtating the laws of variation by a change of diſtance, will be the complete theory of this chemical fact. It is this modification of moving force which is uſually (but moſt vaguely) called the *chemical affinity*, or the *elective attraction of ſilver and aquafortis.*

But alas! we are, as yet, far from having attained this perfection of chemical knowledge. All that we have yet diſcovered is, that the putting the bit of ſilver into the ſpirit of ſalt will not give occaſion to the exertion of this moving force; and we expreſs this obſervation, by calling that unknown force (unknown, becauſe we are ignorant of the law of its action) an *affinity*, an *elective* attraction. And we have obſerved many ſuch elections, and have been able to claſs them, and to tell on what occaſions they will or will not be exerted; and this ſcrap of the complete theory becomes a moſt valuable acquiſition, and the claſſification of thoſe ſcraps a moſt curious, and extenſive, and important ſcience. The chemical philoſopher has alſo the pleaſure of ſeeing gradual approaches made by ingenious men to the complete mechanical explanation of theſe unſeen motions and their cauſes, of which he has arranged the ultimate reſults.

The ordinary chemiſt, however, and even many moſt acute and penetrating enquirers, do not think of all theſe motions. Familiarly converſant with the reſults, they conſider them as principles, and as topics to reaſon from. They think a chemical phenomenon ſufficiently explained, when they have pointed out the affinity under which it is arranged. Thus they aſcribe the propagation of heat to the expanſive nature of fire, and imagine that they conceive clearly how the effect is produced. But if a mathematical philoſopher ſhould ſay, "What is this which you call an expanſive fluid? Explain to me diſtinctly, in what manner this property which you call expanſiveneſs operates in producing the propagation of heat."—We imagine that the chemiſt would find himſelf put to a ſtand. He will then, perhaps for the firſt time, try to form a diſtinct conception of an expanſive fluid, and its manner of operation. He will naturally think of air, and will reflect on the manner in which air actually expands or occupies more room; and he will thus contemplate local motion and mechanical preſſure. He will find, too late, that this gives him no aſſiſtance; becauſe the phenomena which he has been accuſtomed to explain by the expanſiveneſs of fluids have no reſemblance whatever to what we ſee reſult from the actual expanſion of air. Experience has made him acquainted with many effects which the air produces during its expanſion; but they are of a totally different kind from thoſe which he thought that he had ſufficiently explained by the expanſiveneſs of fire. The only reſemblance he obſerves is, that the air and the heat, which were formerly perceived only in a ſmall ſpace, now appear in a much larger ſpace. The mathematician now deſires him to tell in what manner he conceives this expanſiveneſs, or this actual expanſion of air or gas. The chemiſt is then obliged to conſider the air or gas as conſiſting of atoms or particles, which muſt be kept in their preſent ſituation by an external force, the moſt familiar of all to his imagination, namely, preſſure; and all preſſures are equally fit. Preſſure is a moving force, and can only be oppoſed to ſuch another moving force; therefore expanſiveneſs ſuppoſes, that the particles are under the influence of ſomething which would ſeparate them from each other, if it were not oppoſed by ſomething *perfectly of the ſame kind.* It cannot be oppoſed by greenneſs, nor by loudneſs, nor by fear, but only by what is competent to the production of motion; and it may be oppoſed by any *ſuch* natural power; therefore by gravity, or by magnetiſm, or electricity, or corpuſcular attraction, or by an elective attraction. The chemiſt, being thus led to the contemplation of the phenomenon in its moſt ſimple ſtate, can now judge with ſome diſtinctneſs, what is the nature of thoſe powers with which expanſiveneſs can be brought to co-operate or combine. And only now will he be able to ſpeculate on the means for explaining the propagation of heat; and he will perceive, that the general laws of motion, and of the action of moving forces (doctrines which we comprehended under the title of DYNAMICS, *Suppl.)* muſt be reſorted to for a *complete* explanation of all chemical phenomena. The ſame may be ſaid of the phenomena perceived in the growth of vegetables and animals. All of them lead us ultimately to the contemplation of an atom, which is characteriſed by being ſuſceptible of local motion, and requires for this purpoſe the agency of what we call a moving force.

We would diſtinguiſh this particular OBJECT of our CONTEMPLATION (conſiſting of two conſtitutent parts, the atom and the force, related, in fact, to each other by conſtant conjunction) by the term MECHANISM. We conceive it to be the characteriſtic of what we call MATTER; and we would conſider it as the moſt ſimple MECHANICAL PHENOMENON. We are diſpoſed to think, that this moving force is as ſimple and uniform as the atom to which it is related; and we would aſcribe the inconceivable diverſity of the moving forces which we ſee around us to combinations of this univerſal force exerted by many atoms at once; and therefore modified by this combination, in the very ſame manner as we frequently ſee thoſe ſeemingly different moving forces combine their influence on a ſenſible maſs of tangible matter, giving it a ſenſible local motion. Having formed ſuch notions, we would ſay that we do not conceive either the atom or the force as being matter, but the two thus related. And we would then ſay, that whatever object of contemplation does not ultimately lead us to this complex notion is IMMATERIAL; meaning by the epithet nothing more than the negation of this particular character of the object. It is equivalent to ſaying, that the phenomenon does not lead the mind to the conſideration of an atom actuated by a moving force; that is, moved, or prevented from moving, by an oppoſite preſſure or force.

Such is the extenſion which the diſcoveries of laſt century have enabled us to give to the uſe of the term mechaniſm, mechanical action, mechanical cauſe, &c.

The Greeks, from whom we have borrowed the term, gave it a much more limited meaning; confining it to thoſe motions which are produced by the intervention of machines. Even many of the naturaliſts of the preſent day limit the term to thoſe motions which are the *immediate* conſequences of impulſe, and which are caſes of ſenſible motion. Thus the chemiſt ſays, that printers ink is a mechanical fluid, but that ink for writing is a chemical fluid. We make no objection to the diſtinction, becauſe chemiſtry is really a vaſt body of real and important ſcience, although we have, as yet, been able to claſs only very complicated phenomena, and are far from the knowledge of its elements. This diſtinction made by the chemiſts is very clear, and very proper to be kept in view; but we ſhould be at a loſs for a term to expreſs the analogy which is perceivable between theſe ſenſible motions and the hidden motions which obtain even in the chemical phenomena, unleſs we give mechaniſm a ſtill greater extenſion than the effects of percuſſion or impulſion.

Mechanics, in the ancient ſenſe of the word, conſiders only the energy of *organa*, machines. The authors who have treated the ſubject ſyſtematically, have obſerved, that all machines derive their efficacy from a few ſimple forms and diſpoſitions, which may be given to that piece of matter called the tool, 'Οργανον, or *machine*, which is interpoſed between the workman or natural agent, and the taſk to be performed, which is always ſomething to be moved, in oppoſition to reſiſting preſſures. To thoſe ſimple forms they have given the name of MECHANICAL POWERS, ſimple powers, ſimple machines.

The machine is interpoſed for various reaſons.

1. In order to enable a natural power, having a certain determinate intenſity, which cannot be increaſed, to balance or overcome another natural power, acting with a greater intenſity. For this purpoſe, a piece of ſolid matter is interpoſed, connected in ſuch a manner with firm ſupports, that the preſſure exerted on the impelled point by the power occaſions the excitement of a preſſure at the working point, which is equal or ſuperior to the reſiſtance, ariſing from the work, to the motion of that point. Thus, if a rod three feet long be ſupported at one foot from the end to which the reſiſtance of two pounds is applied, and if a preſſure of one pound be applied to the other end of the rod, perpendicular to its length, the coheſive forces which connect the particles of the rod will all be excited, in cer-

tain proportions, according to their ſituation, and the ſupported point will be made to preſs on its ſupport as much as three pounds would preſs on it; and a preſſure in the oppoſite direction will be excited at the working point, equal to the preſſure of two pounds. The reſiſtance will therefore be balanced, and it will be overcome by increaſing the natural power acting on the long diviſion of the rod. This is called a LEVER. Toothed wheels and pinions are a perpetual ſucceſſion of levers in one machine or mechanical power.

2. The natural power may act with a certain velocity which cannot be changed, and the work requires to be performed with a greater velocity. A machine is interpoſed, moveable round a fixed ſupport, and the diſtances of the impelled and working points are taken in the proportion of the two velocities. Then are we certain, that when the power acts with its natural velocity, the working point is moving with the velocity we deſire.

3. The power may act only in one unchangeable direction, and the reſiſtance muſt be overcome in another direction. As when a quantity of coals muſt be brought from the bottom of a pit, and we have no power at command but the weight of a quantity of water. We let the water pull down one end of a lever, either immediately or by a rope, and we hang the coals on the other end, while the middle point is firmly ſupported. This lever may be made perpetual, by lapping the ropes round a cylinder which turns round an axis firmly ſupported. This is a FIXED PULLEY. We can ſet unequal powers in oppoſition, by lapping each rope round a different cylinder, having the ſame axis. This is a WINDLASS or GIN. All theſe forms derive their energy from the lever virtually contained in them.

Any of theſe three purpoſes may be gained by the interpoſition of a ſolid body in another way. Inſtead of being ſupported in one point, round which it is moveable, it may be ſupported by a ſolid path, along which it is impelled, and by its ſhape it thruſts the reſiſting body out of its way. This is the caſe with the WEDGE when it is employed to force up a ſwagging joiſt, or preſs things ſtrongly together. If this wedge be lapped or formed round an axis, it becomes a SCREW or a SPIRAL WIPER. This is alſo the operation of the balance wheel of a horizontal or cylinder watch. The oblique face of the tooth is a wedge, which thruſts the edge of the cylinder out of its way. The pallet of a clock or watch is alſo a wedge, acted on in the oppoſite direction.

Theſe are the different forms in which a ſolid body is interpoſed as a mechanic power. All are reducible to the lever and the wedge.

But there are other mechanic powers beſides thoſe now mentioned. The carmen have a way of lowering a caſk of liquor into a cellar, by paſſing a rope under it, making the end faſt to ſome ſtake cloſe to the ground, and bringing the other end of the rope round the caſk, and thus letting it ſlip down in the bight of the rope. In this proceſs they feel but half of its weight, the other half being ſupported by the end of the rope that is faſtened to the ſtake. This is called a PARBUCKLE by the ſeamen. A hanging pulley is quite the ſame with this more artleſs method. The weight hangs by the axis of the pulley, and each half of the hanging rope carries half of the weight, and the perſon who pulls one of them upwards acts only againſt half of the weight, the other being carried by the hook to which the ſtanding rope is faſtened. This mechanical power does not (as is commonly imagined) derive its efficacy from the pulley's turning round an axis. If it were made faſt, or if the tackle rope merely paſſed through a loop of the rope which carries the weight, it would ſtill require only half of the weight acting on the running rope to balance it. The uſe of the motion round an axis is merely to avoid a very great friction. When the two hanging parts of the rope are not parallel, but inclined in any angle, the force neceſſary for balancing the weight is to the weight as the ſide is to the diagonal of the parallelogram formed by the directions of the three ropes. Varignon calls this the FUNICULAR MACHINE or power. Our ſailors call it the SWIGG.

We may employ the *quaqua verſum* preſſure of fluidity with great effect as a mechanic power. Thus, in the hydroſtatic bellows deſcribed by Graveſande, § 1451, and by Deſaguilliers, the weight of a few ounces of water is made to raiſe ſeveral hundred pounds. In like manner, Dr Wallis of Oxford, by blowing with a pipe into a bladder, raiſed 64 pounds lying on it. Otto Guericke of Magdeburgh made a child balance, and even overcome, the pull exerted by the emperor's ſix coach horſes, by merely ſucking the air from below a piſton. Mr Bramah, ironmonger in Piccadilly, London, has lately obtained a patent for a machine acting on this principle as a preſs.* A piſton of one-fourth of an inch in diameter, forces water into a cylinder of 12 inches diameter, and by this intervention raiſes the piſton of the cylinder. A boy, acting with the fourth part of his ſtrength on the ſmall piſton by means of a lever, raiſes 42 tons, or 94,080 libs, preſſing on the great piſton. It is very ſurpriſing, that this application of the *quaqua verſum* preſſure of fluids has been overlooked for more than a century, although the principle has been inculcated and lectured on by every itinerant teacher, and illuſtrated by the above mentioned experiments of Graveſande and Wallis; nay, it has been expreſsly taught as a mechanic power of great efficacy by the Profeſſor of Natural Philoſophy at Edinburgh every ſeſſion of the college for theſe twenty years paſt, but he never thought of putting it in practice. It forms a moſt compendious machine of prodigious power, and is ſuſceptible of the greateſt ſtrength. If the ſame multiplication of power be attempted by toothed wheels, pinions, and racks, it is ſcarcely poſſible to give ſtrength enough to the teeth of the racks, and the machine becomes very cumberſome and of great expence. But Mr Bramah's machine may be made abundantly ſtrong in very ſmall compaſs. It only requires very accurate execution. We give it all praiſe: but Mr Bramah is miſtaken when he publiſhes it as the invention or diſcovery of a new mechanic power: for it has been familiar to every ſtudent of mechanics and hydroſtatics ever ſince Boyle's firſt publication of his hydroſtatic paradoxes.

MECHOACAN, an Epiſcopal city and capital of the province of its name, ſituated on a large river, well ſtored with fiſh, near the weſt ſide of a lake, about 120 miles weſt of Mexico. It is a large place, having a fine cathedral and handſome houſes belonging to rich Spaniards, who own the ſilver mines at Guanaxoato or Guaxaſiata.—*Morſe*.

MECKLENBURG, a county of Virginia, bound-

* See MACHINERY in this *Suppl.*

ed ſouth by the State of N. Carolina. It contains 14,733 inhabitants, of whom 6,762 are ſlaves.—*ib.*

MECKLENBURG, a county of North-Carolina, in Saliſbury diſtrict, bounded ſouth by the State of S. Carolina. It contains 11,395 inhabitants, of whom 1,603 are ſlaves. Chief town, Charlotte.—*ib.*

MECOWBANISH, a lake in N. America, in 49° N lat. —*ib.*

MEDFIELD, a townſhip in Norfolk county, Maſſachuſetts, 20 miles ſouth-weſterly of Boſton. It was incorporated in 1650, and contains 731 inhabitants. —*ib.*

MEDFORD, a pleaſant, thriving, compact town in Middleſex county, Maſſachuſetts, 4 miles north of Boſton, ſituated on Myſtick river, 3 miles from its mouth. Here are ſeveral diſtilleries and brick-works which give employment to a conſiderable number of people. The river is navigable for ſmall veſſels to this place. The townſhip was incorporated in 1630, and contains 1,029 inhabitants, who are noted for their induſtry.—*ib.*

MEDICAL JURISPRUDENCE. See *MEDICINA Forenſis* in this *Suppl.*

MEDICI, is the name of an illuſtrious family in Florence, which contributed more than perhaps any other family whatever to the revival of letters in Europe. To trace this family from its origin, or even to give biographical ſketches of all the great men whom it produced, would occupy by far too great a part of our work; for, during ſome centuries, almoſt every individual of the houſe of Medici was diſtinguiſhed among his contemporaries. That houſe, after having rendered itſelf memorable in the annals of Florence, for oppoſing the encroachments of the nobles on the liberties of the people, had loſt much of its influence under the ariſtocratic government of the Albizi, when it was raiſed to a rank ſuperior to what it had ever held, by

Giovanni de MEDICI, who was born in the year 1360. This man determined to reſtore his family to ſplendour; but, conſcious of his critical ſituation, ſurrounded as he was by powerful rivals and enemies, he affected rather a ſecure privacy than a dangerous popularity. Even when raiſed to the office of gonfalonier, or generaliſſimo of the republic, he carefully avoided any deſire of partaking in the magiſtracy, and ſeemed to be entirely engroſſed by merchandize, which he extended from the Eaſt throughout Europe. This conduct, as on one hand it threw his enemies off their guard, on the other, enabled him to acquire an immenſe fortune, of which he made a proper diſpoſition amongſt all ranks of people.

Many, even of the ruling party, either gained by his liberality, or pleaſed with his amiable and retired conduct, propoſed to the ſeigniory to admit him into the magiſtracy; and though the propoſal met with great oppoſition, it was carried in the affirmative.

It was by raſhly declaring for the plebeians againſt the nobles that an anceſtor of Giovanni's had loſt to his family their rank in the ſtate. Giovanni, reſolving not to ſplit on the ſame rock, continued to affect privacy and retirement, accepting any office in the ſtate with the utmoſt appearance of reluctance, and never attending at the Palazzo, unleſs particularly ſent for by the ſeigniory. Riſing by theſe means in the eſteem of the people, his enemies became, of courſe, unpopular; and having obtained a decided ſuperiority over his opponents, he now ventured to procure, that thoſe taxes which the nobles had exacted with the utmoſt ſeverity and partiality from the people alone, ſhould be levied upon the two firſt orders, in common with the plebeians: and that a law ſhould be ordained, by which perſonal property might be taxed.

The nobles ſeeing, with the deepeſt concern, their conſequence ſo ſenſibly wounded, and their power ſo much diminiſhed, held ſeveral conſultations in private how they might effect his ruin; but their want of unanimity prevented any thing deciſive from being carried into execution. The people, alarmed for the ſafety of their leader and patron, offered him the ſovereignty, which his relations and friends urged him to accept; but this his prudence forbad him to take, as with the title of lord he would have gained alſo that of tyrant. Thus, by his ſingular prudence, he died poſſeſſed of all the power of the ſtate, with the affectation of being the moſt diſintereſted citizen in the commonwealth. His death happened in the year 1428.

Giovanni was graceful in his perſon, and his affability to all eſtabliſhed his character for moderation. His extenſive knowledge and pleaſantry made his company eagerly ſought. As all his actions were placid and ſerene, he was not in want of that trumpet of ſedition, popular declamation, which he never attempted. Much to his honour, his elevation was not procured even by the baniſhment of a ſingle individual; a circumſtance until then unknown in Florence, where every new adminiſtration was marked with the ruin of families, and by ſcaffolds ſtained with blood.

" The maxims (ſays Mr Roſcoe) which, uniformly purſued, raiſed the houſe of Medici to the ſplendour which it afterwards enjoyed, are to be found in the charge given by this venerable old man, on his death-bed, to his two ſons Coſmo and Lorenzo. 'I feel (ſaid he) that I have lived the time preſcribed me. I die content, leaving you, my ſons, in affluence and in health, and in ſuch a ſtation, that, whilſt you follow my example, you may live in your native place honoured and reſpected. Nothing affords me more pleaſure than the reflection, that my conduct has given offence to no one; but that, on the contrary, I have endeavoured to ſerve all perſons to the beſt of my abilities. I adviſe you to do the ſame. With reſpect to the honours of the ſtate, if you would live with ſecurity, accept only ſuch as are beſtowed on you by the laws, and the favour of your fellow-citizens; for it is the exerciſe of that power which is obtained by violence, and not of that which is voluntarily given, that occaſions hatred and contention."

MEDICI (Coſmo de), the eldeſt ſon of the preceding, was born in 1389. During the life-time of his father, he had engaged himſelf deeply, not only in the extenſive commerce by which the family had acquired its wealth, but in the weightier matters of government. When Giovanni died he was in the prime of life; and though his complexion was ſwarthy, he had an agreeable perſon, was well made, of a proper ſtature, and in converſation united a happy intermixture of gravity with occaſional ſallies of pleaſantry and repartee. His conduct was uniformly marked by urbanity and kindneſs to the ſuperior ranks of his fellow-citizens, and by a conſtant attention to the intereſts and the wants of the lower claſs, whom he relieved with unbounded generoſity. By theſe means he acquired numerous and zealous partizans of every denomination; but he rather conſidered them as pledges for the continuance of the power which he poſſeſſed, than as inſtruments to be employed in extending it to the ruin and ſubjugation of the ſtate. An interchange of reciprocal good offices was the only tie by which the Florentines and the Medici were bound; and perhaps the long continuance of this connection may be attributed to the very circumſtance of its being in the power of either of the parties at any time to have diſſolved it.

But the prudence and moderation of Coſmo could not repreſs the ambitious deſigns of thoſe rival families, who wiſhed to poſſeſs or to ſhare his authority. In the year 1433, Rinaldo de Albizi, at the head of a powerful party, carried the appointment of the magiſtracy. At that time Coſmo had withdrawn to his ſeat in the country, to avoid the diſturbances which he ſaw likely to enſue; but at the requeſt of his friends he returned to Florence, where he was led to expect ſuch a union of parties, as might at leaſt preſerve the peace of the city. No ſooner did he make his appearance in the palace, where his preſence had been requeſted, on pretence of his being intended to ſhare in the adminiſtration of the republic, than he was ſeized upon by his adverſaries, and committed to priſon.

The conſpirators were divided in their opinions as to the diſpoſal of their priſoner. Moſt of them inclined to follow the advice of Peruzzi, who recommended taking him off by poiſon. Coſmo, confined in the Alberzettino, a room in one of the turrets of the Palazzo, could hear this dreadful conſultation, which was determining, not in what manner he ſhould be tried, but in what manner he ſhould be put to death; and finding that he was to die by an infuſion of poiſon ſecretly adminiſtered to him, a ſmall portion of bread was the only food which he thought proper to take.

Coſmo lived in this manner four days; and, ſhut up from all his kindred and friends, he ſoon expected to be numbered with the dead; but here, as it ſometimes happens, he found relief where leaſt expected, from the man who had been engaged to take him off. Malavolta, the keeper of the priſon, either from compunction, diſſatisfaction, or the youth and misfortunes of the illuſtrious ſufferer, relented; and inſtead of purſuing any criminal intentions againſt the life of Coſmo, after upbraiding him with entertaining ſo unworthy an opinion of him, declared that his fears were entirely groundleſs. To convince him of this, he ſat down, and partook of every thing the priſoner choſe to eat of. The expreſſions of gratitude, together with his moſt engaging manners, and great promiſes, entirely won Malavolta, who, to ingratiate himſelf ſtill farther in the good opinion of Coſmo, invited Fargaccio, the moſt celebrated wit in Florence, to dine with him the next day, from the idea that his ſprightly mirth would contribute to lighten his misfortunes.

In the mean time, his brother Lorenzo, and his couſin Averardo, having raiſed a conſiderable body of men in Romagna and other neighbouring diſtricts, and being joined by the commander of the troops of the republic, approached towards Florence to his relief. The apprehenſion, however, that the life of Coſmo might be endangered, if they ſhould proceed to open violence, induced them to abandon their enterpriſe. At length Rinaldo and his adherents obtained a decree of the magiſtracy, by which Coſmo was baniſhed to Padua for ten years, his brother to Venice for five years; and ſeveral of their relations and adherents ſhared the ſame fate.

Coſmo received this determination of his judges with a compoſure that gained him the compaſſion and the admiration of many of his moſt inveterate enemies. He would gladly have left the city purſuant to his ſentence; but he was detained by his enemies till their authority ſhould be eſtabliſhed: and it was not till he thought of bribing the gonfalonier, and another creature of Rinaldo's, that he was privately taken from his confinement, and conducted out of Florence.

Padua, to which he was confined by his ſentence, was in the dominions of Venice; but before he could reach that place, he received a deputation from the ſenate, the purport of which was to condole with him for his misfortunes, and to promiſe him their protection and aſſiſtance in whatever he ſhould deſire. He experienced the treatment of a prince rather than that of an exile. Nor were that wiſe people without good reaſons for ſuch a conduct. Venice had long regarded Florence as her rival in commerce, and hoped, by conferring upon Coſmo the moſt flattering diſtinctions, to prevail upon him to reſide there in future; prudently ſuppoſing, that the manufactories of Florence, and the great commerce the Medici had carried on throughout Italy, and extended far beyond it to the wealthieſt kingdoms in Europe, would become their own by enrolling him amongſt their ſubjects.

The readineſs with which Coſmo had given way to the temporary clamour raiſed againſt him, and the reluctance which he had ſhewn to renew thoſe rencounters which had ſo often deluged the ſtreets of Florence with blood, gained him new friends, even during his exile. The utmoſt exertions of his antagoniſts could not long prevent the choice of ſuch magiſtrates as were known to be attached to the cauſe of the Medici; and no ſooner did they enter on their office, than Coſmo and his brother were recalled, and Rinaldo with his adherents were compelled to quit the city. This event took place about a year after the baniſhment of Coſmo.

The ſubſequent conduct of this great man (for great all allow him to have been) has been painted in different colours by different writers. Mr Noble, after Machiavel, compares his cruelties to his fallen foes with thoſe of Sylla and Octavius to the partizans of Marius and Brutus; whilſt Roſcoe repreſents his conduct as in a high degree amiable and generous. It appears to us evident, from his own words, that he had exerciſed ſome cruelties on his exiled enemies; for when one of them wrote to him, that "the hen was hatching," he replied "She will have but a bad time of it, ſo far from her neſt." When ſome other exiles acquainted him that "they were not aſleep," he anſwered, "he could eaſily believe that, for he thought he had ſpoiled their ſleeping." At another time, ſome of the citizens remonſtrated with him upon the odiouſneſs of his conduct in baniſhing ſo many perſons; telling him, "the republic would be extremely weakened, and God offended, by the expulſion of ſo many good and pious men as he was ſending into baniſhment." His anſwer was, "It would be better for the republic to be weakened than utterly ruined; that two or three yards of fine cloth made many a one look like a good man; but that ſtates were not to be governed or maintained by counting a ſtring of beads, and mumbling over a few *Pater noſters*."

From this time the life of Coſmo de Medici was an almoſt uninterrupted ſeries of proſperity. His misfortunes had taught him, that the affectation of grandeur is more dangerous in a free ſtate than uſurpation. He adopted, therefore, the dreſs, behaviour, and manners, of a private citizen. His clothes were of the ſame faſhion and materials as the reſt of the Florentines. In the ſtreets he walked alone and unguarded. His table was ſupplied from what his eſtate of Mugello produced, nor had he one ſervant more than was abſolutely neceſſary; thus endeavouring to unite the character of a prince with that of a merchant, and a private perſon in a republic.

Whilſt he rejected all offices in the magiſtracy, no buſineſs was tranſacted without its being firſt ſettled at Mugello: nor did he contract any alliances but with the ſons and daughters of the citizens of Florence; yet all foreign princes and courts paid his children the reſpect due only to thoſe of ſovereigns; and the family of Coſmo received educations equal to thoſe of the greateſt potentates.

A proper judgment may be formed of his immenſe traffic, and the prodigious advantages accruing from it: For though a private citizen of Florence only, yet he poſſeſſed at one time more money than what was in all the treaſuries of the different ſovereigns in Europe. When Alfonſo king of Naples leagued with the Venetians againſt Florence, Coſmo called in ſuch immenſe debts from thoſe places, as deprived them of reſources for carrying on the war. During the conteſt between the houſes of York and Lancaſter, he furniſhed Edward IV. with a ſum of money ſo great, that it might almoſt be conſidered as the means of ſupporting that monarch on the throne.

In his public and private charities, in the number and grandeur of the edifices he erected, not only in Florence, but in the moſt diſtant parts of the world, and in the foundations which he endowed, he ſeemed to more than vie with majeſty. He ſupplied moſt of the exigencies of the ſtate from his private purſe; and there were few citizens that had not experienced his liberality, and many without the leaſt application, particularly the nobles.

But in nothing did his munificence produce ſo much good to the world, or acquire ſuch honour to himſelf, as when it was exerted for the promotion of ſcience, and the encouragement of learned men; and upon nothing did Coſmo delight ſo much to exert it. The ſtudy of the Greek language had been introduced into Italy towards the latter part of the preceding century; but it had again fallen into neglect. After a ſhort interval, an attempt was made to revive it, by the intervention of Emanuel Chryſoloras, a noble Greek, who taught that language at Florence, and other cities of Italy, about the beginning of the 15th century. His diſciples, who were numerous and reſpectable, kept the flame alive till it received new aid from other learned Greeks, who were driven from Conſtantinople by the dread of the Turks, or by the total overthrow of the Eaſtern Empire. To theſe illuſtrious foreigners, as well as to the learned Italians, who ſhortly became their ſucceſsful rivals, even in the knowledge of their national hiſtory and language, Coſmo afforded the moſt liberal ſupport and protection. The very titles of the works of ancient authors, which were brought to light by his munificence, would extend this article beyond its proper limits. Such, indeed, was the eſtimation in which theſe works were then held in Italy, that a manuſcript of the hiſtory of Livy, ſent by Coſmo de Medici to Alfonſo king of Naples, with whom he was at variance, conciliated the breach between them.

As the natural diſpoſition of Coſmo led him to take an active part in collecting the remains of the ancient Greek and Roman writers, ſo he was enabled by his wealth, and by his extenſive mercantile intercourſe with different parts of Europe and of Aſia, to gratify a paſſion of this kind beyond any other individual. To this end he laid injunctions on all his friends and correſpondents, as well as on the miſſionaries and preachers who travelled into the remoteſt countries, to ſearch for and procure ancient manuſcripts, in every language, and on every ſubject. The ſituation of the Eaſtern Empire, then falling into ruins, afforded him an opportunity of obtaining many ineſtimable works in the Hebrew, Greek, Chaldaic, Arabic, and other eaſtern languages. From theſe beginnings aroſe the celebrated library of the Medici; which, after various viciſſitudes of fortune, and frequent and conſiderable additions, has been preſerved to the preſent times under the name of the *Bibliotheca Mediceo Laurentiana*.

Nor was Coſmo a mere collector of books, he was himſelf, even in old age, a laborious ſtudent. Having been ſtruck with the ſublime ſpeculations of Plato, which he had heard detailed in lectures by a Greek monk, who had come from Conſtantinople to the council of Florence, he determined to found an academy for the cultivation of that philoſophy. For this purpoſe he ſelected Marſilio Ficino, the ſon of his favourite phyſician, and deſtined him, though very young, to be the ſupport of his future eſtabliſhment. The education of Ficino was entirely directed to the Platonic philoſophy; nor were the expectations which Coſmo had formed of him diſappointed. The Florentine academy was ſome years afterwards eſtabliſhed with great credit, and was the firſt inſtitution in Europe for the purſuit of ſcience, detached from the ſcholaſtic method then univerſally adopted. It is true, the fanciful doctrines of Plato are as remote from the purpoſes of life as the ſubtleties of Ariſtotle; but, by dividing the attention of the learned between them, the dogmas of the Stagyrite were deprived of that ſervile reſpect which had ſo long been paid to them, and men learned by degrees to think for themſelves.

The foſtering hand of Coſmo was held out to art as well as to ſcience; and architecture, ſculpture, and painting, all flouriſhed under his powerful protection. The countenance ſhewn by him to theſe arts was not ſuch as their profeſſors generally receive from the great. It was not conceded as a bounty, nor received as a favour, but appeared in the friendſhip and equality that ſubſiſted between the artiſt and his patron; and the ſums of money, which Coſmo expended on pictures, ſtatues, and public buildings, appear almoſt incredible.

Coſmo now approached the period of his mortal exiſtence: but the faculties of his mind remained unimpaired. About twenty days before he died, he ſent for Ficino, and enjoined him to tranſlate from the Greek the treatiſe of Xenocrates on death. Calling into his chamber his wife and his ſon Piero, he entered into a narrative of all his public tranſactions; in which he gave a full account of his extenſive mercantile connections, and adverted to the ſtate of his domeſtic concerns. To Piero he recommended a ſtrict attention to the education of his ſons; and requeſted, that his funeral might be conducted with as much privacy as poſſible. He died on the firſt of Auguſt 1464, at the age of 75 years, deeply lamented by a great majority of the citizens of Florence. Their eſteem and gratitude had indeed been fully ſhewn ſome time before, when, by a public decree, he was honoured with the title of *Pater Patriæ*, an appellation which was inſcribed on his tomb; and which, as it was founded, ſays Roſcoe, on real merit, has ever ſince been attached to the name of Coſmo de Medici.

Medici (Lorenzo de), juſtly ſtyled the *magnificent*, was the grandſon of Coſmo, and about 16 years of age when his grandfather died. His father Piero de Medici, though poſſeſſed of more than ordinary talents, as well as of a very conſiderable ſhare of worth, was, from various circumſtances, little qualified to maintain the influence which his family had gained in the republic of Florence. From very early life he had been tortured by the gout; and almoſt uninterrupted pain had made him peeviſh. Such a diſpoſition was not calculated to retain the affections of the giddy Florentines, or to perſuade republicans that they were free, while they ſubmitted to the government of a ſingle individual. All this Coſmo had foreſeen, and had done what wiſdom could do to preſerve to his family that aſcendency in the republic which he had himſelf acquired. He exhorted Piero to beſtow the utmoſt care on the education of his ſons, of whoſe capacity he expreſſed a high opinion; he recommended to him Diotiſalvo Neroni, a man whom he had himſelf raiſed from obſcurity to an eminent rank, as a counſellor, in whoſe wiſdom and fidelity he might place the utmoſt confidence: and to bind the inhabitants of Florence to the houſe of Medici by the ſtrongeſt of all ties, he had diſtributed among them, under the denomination of loans, immenſe ſums, which he knew they would not ſoon be able to repay.

Piero paid the utmoſt deference to the dying injunctions of his father. He had himſelf an ardent love of letters; and under the eye of the venerable Coſmo, he had given his two ſons, Lorenzo and Juliano, the beſt poſſible domeſtic education. In the Greek language, in ethics, and in the principles of the Ariſtotelian philoſophy, Lorenzo, the eldeſt, had the advantage of the precepts of the learned Argyropylus (A), and in thoſe of the Platonic ſect he was ſeduloully inſtructed by Marſilio Ficino (ſee Ficinus, *Encycl.*); but for his moſt valuable accompliſhments he was not indebted to any preceptor. To complete his education, however, it was judged expedient that he ſhould viſit ſome of the principal courts of Italy; and very ſoon after the death of his grandfather, he repaired to Rome, Bologna, Ferrara, Venice, and Milan, where he gained the eſteem of all whoſe eſteem was of value.

Thus attentive was Piero to the advice of his father with reſpect to the education of his eldeſt ſon; nor was he leſs attentive to it in the choice of his principal counſellor. He intruſted the whole of his affairs into the hands of Neroni, and gave him Coſmo's accounts to peruſe and ſettle. That ambition, which perhaps had lain lurking in this man's mind, was now called forth, and he baſely formed the ſcheme of ruining the ſon of his patron, by building upon his misfortunes his own future grandeur. For this purpoſe, he lamented the abſolute neceſſity there was for an immediate call upon thoſe who were indebted to Piero as Coſmo's repreſentative; telling him, that a delay might ſubject him to the greateſt inconveniences. Piero conſented, though with reluctance, to his ſuppoſed friend's advice. The reſult was ſuch as Neroni expected. Thoſe who were friends of the father became enemies of the ſon; and had not Piero diſcovered the ſnare, and deſiſted from ſuch rigorous proceedings, he might have found, when too late, that in ſupporting the character of the merchant, he had forgotten that of the ſtateſman; for all the citizens of Florence were his debtors.

Soon after this, an attempt was made to aſſaſſinate Piero, by a powerful party which had always been inimical to the houſe of Medici; but it was defeated by Lorenzo, who diſplayed on that occaſion a ſagacity and promptitude of mind which would have done honour to the oldeſt ſtateſman. A few of the conſpirators were declared enemies to the ſtate, and condemned to baniſhment; but by far the greater part of them were pardoned on the ſolicitation of Lorenzo, who declared, that "he only knows how to conqner, who knows how to forgive."

In the year 1469 Piero de Medici died; and Lorenzo ſucceed to his authority as if it had been a part of his patrimony, being requeſted by the principal inhabitants of Florence, that he would take upon himſelf the adminiſtration of the republic in the ſame manner that his grandfather and father had done.

In the month of December 1470, a league was ſolemnly concluded between the pope, the king of Naples, the duke of Milan, and the Florentines, againſt Mahomet II. who had vowed not to lay down his arms till he had aboliſhed the religion of Chriſt, and extirpated all his followers. The pope, however (Paul II.), died on the 26th of July 1471; and Sixtus IV. ſucceeding to the chair of St Peter, Lorenzo was deputed from Florence to congratulate him on his elevation. Two more oppoſite characters can hardly be conceived than thoſe of Sixtus and Lorenzo. The former was cruel, treacherous, and ſordid; the latter was merciful, candid, and generous. Yet ſuch inſtances of mutual good will took place between them on this occaſion, that Lorenzo, who, under the direction of his agents, had a bank eſtabliſhed at Rome, was formally inveſted with the office of treaſurer of the Holy See.

Piſa had been under the dominion of Florence from the

(A) This man had fled from Conſtantinople, when it was taken by the Turks, to Florence, where he was protected by Coſmo de Medici.

the year 1406, and it had acquired ſome celebrity on account of its academy, which had exiſted almoſt two centuries. That academy, however, had fallen into decay; and, in the year 1472, the Florentines reſolved to reſtore it to its priſtine ſplendour. Five citizens, of whom Lorenzo de Medici was one, were appointed to ſuperintend the execution of their purpoſe; but Lorenzo, who was the projector of the plan, undertook the chief management of it; and, in addition to 6000 florins annually granted by the ſtate, expended, in effecting his purpoſe, a large ſum of money from his private fortune. In doing this, he only imitated the example of his father and grandfather; for in the courſe of 37 years, reckoning from the return of Coſmo from baniſhment, this illuſtrious family had expended on works of charity or public utility upwards of 660,000 florins. "Some perſons (ſaid Lorenzo) would perhaps be better pleaſed to have a part of it in their purſe; but I conceive that it has been of great advantage to the public, and well laid out, and am therefore perfectly ſatisfied."

In the year 1474, Lorenzo incurred the diſpleaſure of the pope for oppoſing ſome of his encroachments on the petty princes of Italy; and the revenge planned by Sixtus was of ſuch a nature as would have diſgraced, we do not ſay a Chriſtian biſhop, but the rudeſt ſavage. He began by depriving Lorenzo of the office of treaſurer of the Roman See, which he gave to the Pazzi, a Florentine family, who as well as the Medici, had a public bank at Rome. By this ſtep he ſecured the intereſt of the Pazzi, who, it is probable, were to govern Florence under the pope, when Lorenzo and Juliano de Medici ſhould be cut off, and their friends and adherents driven from the republic. The principal agent engaged in the undertaking was Franſeſco Salviati archbiſhop of Piſa, to which rank he had lately been promoted by Sixtus, in oppoſition to the wiſhes of the Medici. The other conſpirators were Giacopo Salviati, brother to the archbiſhop; Giacopo Poggio, one of the ſons of the celebrated Poggio Bracciolini (ſee POGGIUS, *Encycl.*); Barnardo Bandini, a daring libertine, rendered deſperate by the conſequence of his exceſſes; Giovanni Battiſti Monteſicco, who had diſtinguiſhed himſelf as general of the pope's armies; Antonio Maffei, a prieſt of Volterra; and Stephano de Bagnona, one of the apoſtolic ſcribes; with ſeveral others of inferior note. The cardinal Riario, then at Piſa, was likewiſe an inſtrument in the conſpiracy; but he can hardly be conſidered as an agent, for he was kept ignorant of what was going on, and enjoined only to obey whatever directions he might receive from the archbiſhop of Piſa.

The aſſaſſination of the illuſtrious youths was fixed for Sunday, April 26. 1478; the place the cathedral of Florence, at the moment the hoſt was to be elevated; and their murder was to be the ſignal for ſeizing and expelling from the walls of the city all their relations and friends. What a tranſaction this for one who preſumed to ſtyle himſelf the vicar of Chriſt, the common father of Chriſtendom, to patronize!

The fatal day arrived, and Lorenzo was already in the church; but Juliano remained at home, occaſioned by a ſlight indiſpoſition. The conſpirators, determining not to loſe one of their victims, went to invite, to intreat him, to go. They embraced (B), and led him, by a tender violence, to the cathedral. The ſignal was given by the elevation of the conſecrated wafer; and whilſt the people fell upon their knees to adore, the aſſaſſins roſe, and, as was concerted, two of them, Franciſco Pazzi and Barnardo Bandini, fell upon Juliano. The latter directed his poignard ſo truly, that it entered into the boſom of the unoffending youth, and he fell mortally wounded at his feet.

In a moment, as muſt be ſuppoſed, all was confuſion. Lorenzo, alarmed, put himſelf in a poſture of defence, when, in an inſtant, Antonio of Volterra, and Stephano a prieſt, the dependant of the archbiſhop, who, upon Giovanni Battiſti's declining the infamous taſk, undertook his deſtruction, ruſhed upon him as their deſtined prey. The conteſt continued ſome time. Lorenzo had received a wound in his neck, and ſeemed to contend for his life in vain; but a ſervant, whom he had lately relieved from priſon, inſpired by gratitude, heroically threw himſelf between his beloved lord and his aſſaſſins receiving in his body thoſe weapons that were aimed at the breaſt of Lorenzo. This fidelity ſaved him; for by one vigorous effort he broke from Antonio and Stephano, and with a few friends ruſhed into the ſacriſty, ſhutting the doors behind them, which were of braſs. Apprehenſions being entertained, that the weapon which had wounded him was poiſoned, a young man ſucked the wound, endangering his own life to ſave that of Lorenzo.

The rage of the people to ſee one of their favourites expiring, and the other covered with blood, was inexpreſſible. The cardinal Riario found it difficult to ſave his life at that altar which he had ſtained by ſo horrid a deed, and to which he then fled for protection.

Whilſt this infamous ſcene was acting in the cathedral, others of the conſpirators were attempting to ſeize the Palazzo; but with no better ſucceſs. The archbiſhop Salviatti, who had undertaken to head them, gave the magiſtrates ſuſpicion by thoſe violent emotions which agitated his whole frame. The nine ſenators who compoſed the magiſtracy, including the gonfalonier, who had been appointed by, and were, in other words, the privy council of the Medici, immediately attacked thoſe who intended to have ſurpriſed them; and Salviatti and his followers had no ſooner gained the ſecond floor, than they found themſelves priſoners.

Jacobo Pazzi ſoon appeared in the ſtreet, proclaiming, with exultation, the murder of Juliano; and inviting the Florentines to free themſelves from the Medicean ſlavery; but perceiving that he was not joined by the people, the magiſtrates ſent off 100 horſe to the reſcue of Lorenzo. This was the more to be commended, becauſe they continued to be aſſaulted by the conſpirators, who, finding their ſituation deſperate, forced themſelves to the ground floor, determining, if poſſible, to ſeize the Palazzo. The magiſtrates, with their attendants, acted with ſuch reſolution and valour, that as often

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(B) The aſſaſſins embraced Juliano, to diſcover whether he wore any ſecret armour, that they might know where to ſtrike with the ſureſt aim.

ten as they gained an entrance, they drove them back, killing ſome of the aſſailants upon the ſpot, others they threw out of the windows upon the pavement; and to ſtrike an awe into thoſe that were without, they had the boldneſs and virtue to hang the archbiſhop from one of the windows, dreſſed as he was in his pontifical robes, with Poggio, another of the chief conſpirators. Florence reſounded in every part with the exclamation—Medici, Medici! down with their enemies!

Lorenzo was liberated from that part of the cathedral to which he had fled, and conveyed home in triumph, where his wounds were attended to, and where he found himſelf ſurrounded by his moſt valuable friends, to whom he was endeared by the ſhocking occurrences of the day. His partizans, however, did not ſpend their time only in lamentations for the death of one of the brothers, and exultations for the preſervation of the other; they united in purſuing the conſpirators, ſparing none that fell into their hands. Jacobo Pazzi was taken flying with his forces into Romania, and immediately hung. An officer of the pope's, who commanded a brigade under count Hironimo, had alone the favour of decapitation. Bandini fled privately to Piſa, thence to Naples, and, laſtly, to Conſtantinople; but Mahomet, to oblige Lorenzo, ſeized, and ſent him back; and he was hung out of the ſame window from which the archbiſhop had ſuffered. An embaſſy was ſent from Florence to thank the ſultan in the name of the republic.

Throughout the whole of this juſt but dreadful retribution, Lorenzo had exerted all his influence to reſtrain the indignation of the populace. He entreated that they would reſign to the magiſtrates the taſk of aſcertaining and of puniſhing the guilty, leſt the innocent ſhould be incautiouſly involved in deſtruction; and his appearance and admonitions had an inſtantaneous effect. By his moderation, and even kindneſs to the relatives of the conſpirators, he ſought to obliterate the remembrance of paſt diſturbances; and by his interference, even the ſurvivors of the Pazzi were reſtored to their honours, of which they had been deprived by a decree of the ſtate.

The generoſity and moderation of Lorenzo had no effect on the temper of Sixtus, who ſolemnly excommunicated him, the gonfalonier, the magiſtrates, and their immediate ſucceſſors; and in the bull which he iſſued on this occaſion, he ſtyles Lorenzo de Medici "the child of iniquity, and the nurſling of perdition!" Not content with this ebullition of reſentment, he ſuſpended the biſhops and clergy of the Florentine territories from the exerciſe of their ſpiritual functions; thus laying the whole republic under an interdict. This had been a formidable weapon in the hands of his predeceſſors, who had, by means of it, overawed the moſt powerful monarchs; but the general character of Sixtus was ſo infamous, and his preſent injuſtice ſo manifeſt, that by the exertions of the biſhop of Arezzo, a convocation was held in the cathedral church of Florence, in which Sixtus was accuſed of *fornication* and *adultery*, with other infamous vices; declared to be the principal inſtigator of the conſpiracy againſt the Medici; and the ſentence of excommunication which he had fulminated againſt Lorenzo and the Florentine magiſtrates was called in direct terms, the "execrable malediction of a damned judge *(maledictam maledictionem damnatiſſimi judicis)*!

How ſuch language could be reconciled to the notions which then prevailed of the ſanctity of the pope, and the plentitude of his power, it is needleſs to inquire; but the reader will not be ſurpriſed that the prelates, who made uſe of it, paid no regard to the interdict of Sixtus. The pontiff, however, did not relax from his purpoſe. Whilſt he brandiſhed with one hand the ſpiritual weapon, which the Florentines treated with ſuch contempt, in the other, he graſped a temporal ſword, which he now openly, as he had before ſecretly, aimed at the breaſt of Lorenzo. At his inſtigation the king of Naples diſpatched an envoy to Florence, to require the citizens to baniſh Lorenzo from the Tuſcan territories, if they would not incur the vengeance both of him and of the pope. Theſe threats produced not the intended effect; for the Florentines avowed their firm reſolution to ſuffer every extremity, rather than betray the man whom they conſidered as guardian of the republic. War therefore was commenced; and the republic was on the point of being ruined, when Lorenzo taking advantage of a truce, threw himſelf, with a reſolution not to be equalled, into the hands of the king of Naples. He judged, perhaps, that any ſtipulations for his perſonal ſafety would be uſeleſs with a prince who had ſported with honour, juſtice, mercy, and the moſt ſolemn treaties. But, whilſt all viewed him as a victim who had devoted himſelf to ſave his country, he, by perſuaſive eloquence, obtained of this crafty perfidious monarch a ſeparate peace, and returned to Florence crowned with a ſucceſs that no one thought poſſible, and where he was received as its tutelar deity. The pope, however, continued inflexible, till a deſcent of the Turks upon Italy reſtored him to his ſenſes, and made him willing to receive the ſubmiſſion of Florence, and reconcile its inhabitants to the church.

Soon after the termination of the hoſtilities between Sixtus and the republic of Florence, Lorenzo began to unfold plans for ſecuring the peace of Italy, which confer the higheſt honour on his political life. To counterpoiſe all the jarring intereſts of the petty ſtates of which that country was compoſed, to reſtrain the powerful, ſuccour the weak, and to unite the whole in one firm body which might be able, on the one hand, ſucceſsfully to oppoſe the formidable power of the Turks, and, on the other, to repel the incurſions of the French and Germans, were the important ends which this great man propoſed to accompliſh. But before he engaged in theſe momentous undertakings, he had further perſonal dangers to encounter. By the inſtigation of Cardinal Riario, and ſome Florentine exiles, one Battiſta Fraſcobaldi, with only two aſſiſtants, undertook to aſſaſſinate him in the church of the Carmeli, on the feſtival of the aſcenſion 1481; but the plot was diſcovered, the conſpirators executed, and Lorenzo henceforth ſeldom went abroad without being ſurrounded by a number of tried friends.

Lorenzo was now at liberty to proſecute his benevolent purpoſes; and after contributing to the expulſion of the Turks from Italy, he ſet himſelf in good earneſt to ſupport the weak ſtates againſt the encroachments of the more powerful. This neceſſarily embroiled the republic at one time with the pope, at another with the king of Naples; now with the Venetians, and then with the Duke of Milan; but when ſome exclaimed againſt him as being too precipitate in involving the republic in dangerous and expenſive wars, he explained to them the neceſſity of maintaining the balance of power, if they would preſerve the independence of their own ſtate; and ſo completely had he made himſelf maſter of this ſubject that he convinced the moſt incredulous of the propriety of his meaſures, which, in 1488, introduced general tranquillity into Italy.

At this period, the city of Florence was at its higheſt degree of proſperity. The vigilance of Lorenzo had ſecured it from all apprehenſions of external attack; and his acknowledged diſintereſtedneſs and moderation had almoſt extinguiſhed that ſpirit of internal diſſenſion for which it had been ſo long remarkable. The Florentines gloried in their illuſtrious citizen, and were gratified by numbering in their body a man who wielded in his hands the fate of nations, and attracted the reſpect and admiration of all Europe.

Yet amidſt public affairs ſo intricate and ſo momentous, ſuch was the capacity of this man's mind, and ſuch his verſatility of genius, that for the greater part of his life, he carried on a commerce as extenſive as that of his grandfather, whilſt he afforded ſtill greater encouragement to learning and learned men. Coſmo had greatly promoted the ſtudy of the ancient languages and ancient philoſophy. Lorenzo did the ſame thing: but he did much more; he encouraged the cultivation of his own tongue, which had been neglected ſince the age of Petrarca; and by ſetting a great example himſelf, he produced a race of Italian poets, which have hardly been ſurpaſſed in any age or nation. To enumerate even the names of the elegant ſcholars whom he patroniſed, would extend this article far beyond its limits. In the academy of Piſa, of which mention has been already made, the ſtudies were chiefly confined to the Latin language, and to thoſe ſciences of which it was the principal vehicle. At Florence the Greek tongue was taught under the ſanction of a public inſtitution, either by native Greeks or learned Italians, whoſe ſervices were procured by the diligence of Lorenzo de Medici, and repaid by his bounty. He placed Michael Angelo at the head of an academy, which he erected for painting and ſculpture, furniſhing it with the beſt models of antiquity. He built and endowed a public library, and ſent Laſcaris, of imperial deſcent, to Conſtantinople more than once, to procure Greek manuſcripts. For father Moriano, the orator, a monaſtery was built; and Florence owed many of her fineſt edifices to him. Politiano and Ficino were among his moſt intimate friends; and it is not perhaps too much to ſay, that he did more for letters and ſcience and art than any other individual that ever exiſted. His own acquirements in learning were great; and his poetry, of which the reader will find many ſpecimens in the elegant work of Roſcoe, was exquiſite.

Is it ſurpriſing, when we examine Lorenzo's character, that all Italy, all Chriſtendom, even the Mahometans, gave him the moſt flattering marks of approbation, and ſtrove who ſhould oblige him moſt, by preſenting him with whatever was rare and valuable? His palace was conſtantly filled with men famous in every elegant, every uſeful ſcience, and the neighbouring princes flocked to it as to the temple of wiſdom. The celebrated prince of Mirandola, on his account, choſe Florence for his reſidence, and died there.

To a moſt engaging perſon was added each grace, and every accompliſhment. He was the favourite of the ladies, the envy of the men, and the admiration of both. The ſtateſman of his time; unrivalled in chivalry; one of the moſt eminent orators that the world has produced. His poetic merit, with his judgment in, and patronage of that art, procured him the title of "Father of the Muſes." In liberality to his fellow-citizens, as well as in every other reſpect, except as a general, he exceeded even Cæſar himſelf; and had not peace been his dear delight, his talents would have made him a conſummate commander. Yet with all theſe ſuperior accompliſhments, he did not think it beneath him to indulge in amuſements which perſons, leſs wiſe, would have thought an impeachment of their underſtanding, and he would often ſeek pleaſure in his nurſery, ſpending hours there in all the frivolous pranks of childiſh diverſion. In fine, "the gravity of his life, if compared with its levity, muſt make him appear as a compoſition of two different perſons, incompatible, and, as it were, impoſſible to be joined with the other."

Lorenzo, like moſt other great men, had wiſhed to ſpend his laſt years in the tranquillity of retirement. He therefore at an early period wound up his mercantile concerns, and divided his time between the cares of the republic at Florence, and the cultivation of his eſtates in the country. He wiſhed even to diveſt himſelf of all public concerns, and get his ſecond ſon Giovanni admitted into holy orders at the age of ſeven years, that he might be fit for eccleſiaſtical preferment before he ſhould be deprived of the protection of his father. The young eccleſiaſtic, who afterwards made ſuch a figure as Leo X. was accordingly appointed by Louis XI. of France, abbot of Fonte Dolac, before he was eight years of age; and by Innocent VIII. a cardinal, when he was little more than thirteen. This added much to the influence of the family, not only in the Tuſcan ſtates, but through all Italy; and Lorenzo having introduced his eldeſt ſon into public life, and accompliſhed a marriage between him and the daughter of a noble family at Rome, thought he might commit the affairs of the republic in a great meaſure to Piero, and indulge his own taſte in the converſation of his learned friends. This dream of felicity however was not realized. Early in the year 1492, he was attacked by a diſeaſe, under which he had long laboured, with ſuch violence, that on the 8th of April he died in the midſt of his weeping friends, after having taken of them, one by one, an affectionate farewell, and given to his ſon Piero much ſalutary counſel, which he thought not fit to follow.

The character of this great and good man is developed in the detail which we have given of his conduct through life: But it may not be improper to add, that ſuch was the love and veneration of the citizens to him, that the phyſician, who had attended him on his deathbed, afraid to return to Florence, left the houſe in a ſtate of diſtraction, and plunged himſelf into a well. Throughout the reſt of Italy the death of Lorenzo was regarded as a public calamity of the moſt alarming kind. Of the arch which ſupported the political fabric of that country he had long been conſidered as the centre, and his loſs ſeemed to threaten the whole with immediate deſtruction. When Ferdinand king of Naples was informed of the event, he exclaimed, "This man has lived long enough for his own glory, but too ſhort a time for Italy."

MEDICINA FORENSIS, is a phraſe uſed in Germany to denote thoſe parts of anatomical and phyſiological knowledge, which enable phyſicians and ſurgeons to decide certain cauſes as judges in courts of juſtice. In that country it has long been law and cuſtom (if we miſtake not, by the Caroline code of Charles V.) to refer caſes of *poiſoning*, *child-murder*, *rape*, *pregnancy*, *impotency*, *ideotiſm*, &c. to the medical faculty, which, in the univerſities and ſome other great towns, is conſtituted into a kind of court for the trial of ſuch queſtions. In this country there are no ſuch courts; but in criminal trials medical gentlemen are often called upon to deſcribe the ſymptoms of *poiſoning*, *child-murder*, *rape*, &c. and therefore it becomes them to obtain an accurate knowledge of theſe ſymptoms, and to ſtore their memories with a number of minute facts, to which they may have occaſion to appeal when giving their evidence.

The importance of this ſubject induced the profeſſor of the inſtitutes of phyſic in the univerſity of Edinburgh to reſolve lately to read an annual courſe of lectures on MEDICAL JURISPRUDENCE. This, we doubt not, will prove a valuable courſe; for though it is hardly conceivable that, under the head *medical juriſprudence*, any *knowledge* can be communicated which a well educated phyſician would not neceſſarily have acquired, without attending ſuch a courſe; yet it is very obvious, that the recollection of the young phyſician may receive great aid from his liſtening to the well arranged lectures of an accurate profeſſor. From theſe lectures he may ſtore his mind with a collection of aphoriſms which ſhall be always ready on the day of examination; or the lectures themſelves may be delivered in queſtions and anſwers with all the formalities of a criminal court.

We have heard it obſerved, that to attend a courſe of ſuch lectures would be of the utmoſt advantage to all who may be called upon to ſerve as jurymen in criminal trials; but of the truth of this obſervation we are more than doubtful. Perſons who are only *half* inſtructed are always conceited of their own attainments; and men not acquainted with anatomy and phyſiology cannot be *more* than half inſtructed by the ableſt courſe poſſible to be given of medical juriſprudence. Such perſons indeed can hardly avoid miſtaking the ſenſe of the profeſſor's language, however perſpicuous that language may be. Of this we had lately a very ſtriking inſtance. A gentleman, by no means illiterate, though a ſtranger to anatomical and phyſiological ſcience, was expatiating to the writer of this article upon the general importance of medical juriſprudence, a courſe of which, he ſaid, he had attended for the ſole purpoſe of qualifying himſelf for diſcharging the important duties of a juryman. Upon being aſked what he had learned? he replied, that he had been taught, among other things which we thought frivolous, to diſcern, from the ſymptoms of *hanging*, whether the dead man had been hanged by *himſelf* or by *another*. We need not ſurely obſerve, that no ſuch leſſon was ever taught in any univerſity, or by any medical lecturer; but it is worthy of conſideration, whether lectures on medical juriſprudence may not have the moſt pernicious effects on the minds of men ſo little qualified as this gentleman to profit by them. To the regularly educated phyſician and ſurgeon ſuch lectures may prove uſeful; to the plain citizen, not ſkilled in anatomy and phyſiology, they muſt prove dangerous; as their only tendency is to make him deſpiſe the evidence given before him by the regular phyſician or ſurgeon; to place implicit confidence in his own ſuperficial knowledge; and thus to decide at random on the life or death of his fellow-creature:

> A little learning is a dangerous thing;
> Drink deep, or taſte not the Pierian ſping.

MEDINA, the capital of the kingdom of Woolli in Africa, is ſituated in 13° 40′ N. Lat. and 12° 40′ W. Long. It is a place of conſiderable extent, and may contain from 800 to 1000 houſes. It is fortified in the common African manner, by a ſurrounding high wall built of clay, and an outward fence of pointed ſtakes and prickly buſhes; but the walls are neglected, and the outward fence has ſuffered conſiderably from the active hands of buſy houſewives, who pluck up the ſtakes for firewood. Mr Park paſſed through it on his route eaſtward, and was treated with much kindneſs both by the king and the people. The good old ſovereign warned him of the dangers he was about to encounter, and endeavoured to perſuade him to relinquiſh all thoughts of his journey eaſtward; but when he could not prevail, he gave him a guide, who conducted him in ſafety to Koojar, the frontier town of the kingdom towards Bondou, from which it is ſeparated by an intervening wilderneſs of two days journey. Here our author was preſented, by way of refreſhment, with a liquor which taſted ſo much like the ſtrong beer of his native country (and very good beer too), as to induce him to inquire into its compoſition; and he learned, with ſome degree of ſurpriſe, that it was actually made from corn which had been previouſly malted, much in the ſame manner as barley is malted in Great Britain: a root yielding a grateful bitter was uſed in lieu of hops, the name of which he forgot; but the corn which yields the wort is the *holcus ſpicatus* of botaniſts.

MEDOCTU, a ſettlement in New-Brunſwick, ſituated on the weſt ſide of St John's river, 35 miles above St Annes.—*Morse.*

MEDOROSTA, a lake in the north part of the Diſtrict of Maine, whoſe northern point is within 8 miles of the Canada line, in lat. 47° 56′, and long. 68° 22′ W. It gives riſe to Spey river, which runs S. S. E. into St John's river.—*ib.*

MEDUNCOOK, a plantation in Lincoln county, Diſtrict of Maine, 230 miles from Boſton, having 322 inhabitants.—*ib.*

MEDUSA. In addition to the different ſpecies of this genus of vermes deſcribed in the *Encyclopædia*, that which is repreſented in two different attitudes, fig. 1. and 2. and which ſtrongly reſembles a bagpipe in ſhape, may be worthy of notice. It is merely a white tranſparent veſicle, furniſhed with ſeveral blue tentacles yellowiſh at their extremity; its long tail, which is alſo blue, appears to be compoſed of a number of ſmall glandulous grains, flattened and united together by a gelatinous membrane. The upper part of the veſicle exhibits a kind of ſeam with alternate punctures of three different ſizes; its elongated part, which may be conſidered as the head of the animal, is terminated by a ſingle trunk, the exterior edge of which is fringed with 25 or 26 tentacles, much ſmaller than thoſe which originate from the inſertion of its long tail, and the number of which ſometimes amounts to 30. By means of theſe laſt,

Plate XXXVI.

laſt, the diameter of which it is capable of increaſing at pleaſure by forcing in a little of the air from its body, it fixed itſelf to the ſide of the veſſel, in which it was placed, in ſuch a manner as that the extremity of ſome of its tentacles occupied a ſurface of two or three lines from its body. The moſt moveable part of the veſicle is its elongation, or the head of the animal, as it is by means of this that it performs its different motions. The rounded ſubſtance, marked by the letter P, is ſituated in the centre of the larger tentacles, which are firmly fixed to the body of the animal near its tail; and is only an aſſemblage of a few minute gelatinous globules, from the middle of which ariſe other larger globules, with a ſmall peduncle, about the middle of which is fixed a curved bluiſh coloured body, which is repreſented magnified in two poſitions at R. Martiniere, the naturaliſt, who accompanied Perouſe in his voyage round the world, met with this animal in about the 20th degree of lat. and 179° of long. eaſt from Paris.

MEDWAY, a townſhip in Norfolk county, Maſſachuſetts, bounded eaſt and ſouth by Charles river, which ſeparates it from Medfield, and of which it was a part until 1713. It has two pariſhes of Congregationaliſts, and contains 1,035 inhabitants. It is 25 miles ſouth-weſt of Boſton, on the middle poſt-road from thence to Hartford.—*Morſe.*

Medway, or *Midway*, a ſettlement in Liberty county, Georgia, formed by emigrants from Dorcheſter in S. Carolina, about the year 1750, and whoſe anceſtors migrated from Dorcheſter and the vicinity of Boſton about the year 1700. A handſome Congregational meeting-houſe, belonging to this ſettlement, was burnt by the Britiſh during the war, and the ſettlement was deſtroyed. It has ſince recovered, in a conſiderable degree, its former importance. Medway is 30 miles ſouth of Savannah, and 9 weſt of Sunbury.—*ib.*

MEGAMETER, a name ſometimes given to the Micrometer, which ſee, *Encycl.*

MEHALL, in the language of Bengal, a place or diſtrict.

M'KESSENSBURG, a town of Pennſylvania, York county, on Tom's Creek, 40 miles W. S. W. of York.—*Morſe.*

MEHERRIN, a principal branch of Chowan river, in N. Carolina, which riſes in Charlotte county, Virginia, and running an eaſt by ſouth courſe, unites with the Nottaway about 7 miles ſouth of the Virginia line. —*ib*

MELAQUE PORT, on the weſt coaſt of New-Mexico, is to the north-weſt of Port Natividad, or Nativity, and near 3 leagues at ſouth-eaſt from a row of 4 or 5 rocks, or naked iſlands above water, in the direction of north-weſt. This port is land-locked againſt all winds from the north-weſt to the ſouth-weſt. —*ib.*

MELA, or *Mala*, on the coaſt of Peru in S. America, lies between Canette and Chilca. It is 3 leagues from Aſia Iſland, whoſe latitude is about 13° 6′ S.—*ib.*

MELAWASKA, a French ſettlement of about 70 families, ſecluded in a ſingular manner from the reſt of mankind, in the north-eaſtern part of the Diſtrict of Maine. Theſe people are Roman Catholics, and are induſtrious, humane, and hoſpitable.—*ib.*

MELETECUNK *River*, in Monmouth county, New-Jerſey, falls eaſtward into Beaver Dam, which is at the head of the bay which is north of Cranberry New Inlet.—*ib.*

MEMORONCOK, a ſtream a little weſt of Byram river. Douglaſs ſays the partition line between New-York and Connecticut, as ſettled Dec. 1, 1664, ran from the mouth of this river N. N. W. and was the ancient limits of New-York, until Nov. 23, 1683, when the line was run nearly the ſame as it is now ſettled.—*ib.*

MEMORY ROCKS, amongſt the Bahama Iſlands, are in lat. 27° 20′ N. and long. 79° 40′ W.—*ib.*

MEMPHREMAGOG, a lake chiefly in the province of Canada, 40 miles in length from north to ſouth, and 2 or 3 wide from eaſt to weſt. The north line of Vermont State paſſes over the ſouth part of the lake in 45° N. lat. Memphremagog, which has communication, by the river St Francis, with St Lawrence river, is the reſervoir of 3 conſiderable ſtreams, viz. Black, Barton, and Clyde rivers, which riſe in Vermont. The ſoil on its banks is rich, and the country round it is level.—*ib.*

MEMRAMCOOK *River* has been recommended as the moſt proper boundary between the province of New-Brunſwick and Nova-Scotia. It lies a little to the eaſtward of Petitcodiak, and takes a north-eaſterly direction.—*ib.*

MENADOU *Bay*, or *Panadou*, is 2 leagues from Port Balene, or Port Nove, on the coaſt of Cape Breton Iſland, at the ſouth part of the gulf of St Lawrence, having the iſland of Scatari, heretofore called Little Cape Breton, oppoſite to it.—*ib.*

MENDHAM, a townſhip in Morris county, New-Jerſey, 3 miles north-weſterly of Veal-town, and 6 weſt of Morriſtown.—*ib.*

MENDOCIN, a cape on the north-weſt coaſt of America, and N. Pacific ocean. N. lat. 42° 20′, W. long. 130° 5′.—*ib.*

MENDON, a poſt-town in Worceſter county, Maſſachuſetts, 37 miles ſouth-weſt of Boſton, and 31 north-eaſt of Pomfret in Connecticut. This townſhip, called *Quanſhipauge* by the Indians, was incorporated in 1667, and contains 2 Congregational pariſhes, a ſociety of Friends, and 1555 inhabitants. It is bounded on the ſouth by the State of Rhode-Iſland. It is watered by Charles and Mill rivers, and other ſmall ſtreams, which ſerve 5 griſt-mills, 2 ſaw-mills, 2 clothier's works and a forge. There are 3 hills here, viz. Caleb's, Wigwam, and Miſkee, from either of which may be ſeen, in a clear day, the 4 New-England States.—*ib.*

MENDOZA, a juriſdiction in Chili, in S. America. It has a town of the ſame name, and lies on the eaſt ſide of the Cordillera, about 50 leagues from Santiago, in a plain adorned with gardens, well ſupplied with water by means of canals. The town contains about 100 families, half Spaniards and the other half caſts, together with a college founded by the Jeſuits, a parochial church, and 3 convents. In the juriſdiction are alſo the towns of St Juan de la Frontera, ſituated on the eaſt of the Cordillera, and about 30 leagues north of Mendoza; and St Louis de Loyola, about 50 eaſt of Mendoza; the latter is very ſmall, but has a pariſh church, a Dominican convent, and a college founded by the Jeſuits.—*ib.*

Mendoza, a river which riſes in the Cordillera of the Andes in S. America. Over this river is a natural bridge of rocks, from the vaults of which hang ſeveral pieces of ſtone reſembling ſalt, which congeal like iſicles, as the water drops from the rock. This bridge is broad enough for 3 or 4 carts to paſs a-breaſt. Near this is another bridge, called the bridge of the Incas, betwixt two rocks; and "ſo very high from the river, that the ſtream, which runs with great rapidity, cannot be heard."—*ib.*

MENICHLICK *Lake*, in the north-weſt part of N. America, lies in lat. 61° N. long. 105° W. North of this is Lake Dobount.—*ib.*

MENINSKI (Franciſcus), a moſt celebrated German orientaliſt, was born in Lorraine, then ſubject to the emperor, in the year 1623; and for copiouſneſs of learning, elegance of genius, and profound knowledge of languages, particularly thoſe of the Eaſt, proved undoubtedly one of the principal ornaments of the age in which he lived. He ſtudied at Rome under Giattino. When he was about 30, his love of letters induced him to accompany the Poliſh ambaſſador to Conſtantinople, where he ſtudied the Turkiſh language under Bobovius and Ahmed, two very ſkilful teachers. So ſucceſsful was he in this ſtudy, that when he had been there only two years, the place of firſt interpreter to the Poliſh embaſſy at the Porte was promiſed to him. When the place became vacant, he was accordingly appointed to it, and obtained ſo much credit by his conduct, that, after a time, he was ſent for into Poland, and again ſent out with full powers as ambaſſador to the Porte. For his able execution of this office, he was further honoured, by being naturalized in Poland; on which occaſion he added the Poliſh termination of *ſki* to his family name, which was Menin. Being deſirous afterwards to extend his ſphere of action, he went to the court of the emperor as interpreter of oriental languages in 1661. Here alſo, as in other inſtances, his talents and behaviour obtained the higheſt approbation; on which account he was not only ſent as interpreter to ſeveral imperial ambaſſadors at the Porte, but was intruſted in many important and confidential ſervices; and, in 1669, having paid a viſit to the holy ſepulchre at Jeruſalem, was made one of the knights of that order. After his return to Vienna he was advanced to further honours; being made one of the counſellors of war to the emperor, and firſt interpreter of oriental languages. At Vienna he died at the age of 75, in the year 1698. His great work, 1. The "Theſaurus linguarum orientalium," was publiſhed at Vienna in 1680, in 4 vols folio; to which was added, in 1687, another volume, intitled, "Complementum Theſauri linguarum orientalium, ſeu onomaſticum Latino-Turcico-Arabico-Perſicum." The former volumes having become extremely ſcarce, partly on account of the deſtruction of a great part of the impreſſion, in the ſiege of Vienna by the Turks in 1683, a deſign was formed ſome time ago in England of reprinting the work, by a ſociety of learned men, among whom was Sir William Jones. But as this undertaking, probably on account of the vaſt expence which muſt have been incurred, did not proceed, the empreſs queen Maria Thereſa, who had heard of the plan, took it upon herſelf, and with vaſt liberality furniſhed every thing neceſſary for its completion. In conſequence of this, it was begun to be ſpendidly republiſhed at Vienna in 1780, with this title: "Franciſci a Meſgnien Meninſki Lexicon Arabico-Perſico-Turcicum, adjecta ad ſingulas voces et Phraſes interpretatione Latinâ, ad uſitatiores, etiam Italicâ." Of this edition only two vols folio are yet publiſhed, extending no farther than *zal*, the ninth letter of the Arabic alphabet, which is about a third of the whole. The delay of the reſt is much to be lamented. In this edition, ſay the editors, the Lexicon of Meninſki may be ſaid to be increaſed, diminiſhed, and amended. *Increaſed*, becauſe many Arabic and Perſian words are added, from Wankuli and Ferhengi, the beſt Arabic and Perſic lexicographers whom the Eaſt has produced; and from Herbelot are inſerted the names of kingdoms, cities, and rivers, as well as phraſes in common uſe among the Turks, &c. *Diminiſhed*, becauſe many uſeleſs ſynonyma are omitted, which rather puzzled than aſſiſted the ſtudent; as well as all the French, Poliſh, and German interpretations, the Latin being conſidered as ſufficient for all men of learning. *Amended*, with reſpect to innumerable typographical errors; which, however, from a work of this nature, no care can perhaps altogether exclude. The other works of Meninſki were occaſioned chiefly by a violent conteſt between him and a man named J. B. Podeſta, in which much acrimony was employed on both ſides. Theſe it is hardly worth while to enumerate, but they may all be ſeen in the account of his life from which this article is taken (A). It ſhould be obſerved, however, that in 1674, Podeſta publiſhed a book, intitled, "Prodromus novi linguarum orientalium collegii, juſſu Aug. &c. erigendi, in Univ. Viennenſi;" to which Meninſki oppoſed, 2. "Meninſkii Antidotum in Prodromum novi ling. orient. collegii, &c." 4to. But ſuch was the credit of his antagoniſt in the univerſity, that ſoon after there came out a decree in the name of the rector and conſiſtory, in which that antidote of Meninſki's is proſcribed and prohibited, for ſix ſpecific reaſons, as impious and infamous. Meninſki was defended againſt this formidable attack by a friend, in a ſmall tract, intitled, "Veritas defenſa, ſeu juſtitia cauſæ Dn. F. de M. M. [Meninſki] contra infame decretum Univerſitatis Viennenſis, Anno 1674, 23 Novembris, &c. ab Amico luci expoſita, Anno 1675," in which this friend expoſes, article by article, the falſehood of the decree, and exclaims ſtrongly againſt the arts of Podeſta. This tract is in the Britiſh Muſeum. Podeſta was oriental ſecretary to the emperor, and profeſſor of thoſe languages at Vienna; but is deſcribed in a very ſatirical manner by the defender of Meninſki. "Podeſta, natura Semi-Italus, ſtatura nanus, cæcutiens, balbus, imo bardus repertus, aliiſque vitiis ac ſtultitiis plenus, adeoque ad diſcendas linguas orientales inhabilis." A liſt of the works of Podeſta is, however, given by the late editors of Meninſki.

MENIOLAGOMEKAH, a Moravian ſettlement E. of the Great Swamp, at the head of Lehigh river in Pennſylvania, about 33 miles N. W. by N. of Bethlehem.—*Morſe.*

MENOLOPEN, a wealthy and pleaſant farming

(A) We have taken this article from the Biographical Dictionary; the editors of which took it from the life of Meninſki prefixed to the new edition of his great work.

ſettlement, in Monmouth county, New-Jerſey; making a part of a rich glade of land, extending from the ſea, weſtward to Delaware river. It is 18 miles ſouth-eaſt of Princeton.—*ib.*

MERCER, a county of Kentucky, adjoining Woodford, Shelby, and Madiſon counties. Harrodſburg is the chief town.—*ib.*

MERCERSBOROUGH, a village of Pennſylvania, S. E. of North Mountain, and about 13 miles S. W. of Chamberſburg.—*ib.*

MERCER's *Creek*, in the N. E. part of the iſland of Antigua, in the W. Indies, is a pretty deep inlet of the coaſt, the entrance to which is between the iſlands of Codrington, Crumps, or Pelican. Lavicount's Iſland is a ſmall iſland alſo within it towards the ſouth ſhore; and in the ſouth-weſt part of it is Farley's Bay, at the mouth of a river.—*ib.*

MERCHANT's *Careening Place*, within the harbour of Port-Royal in Jamaica, on the N. ſide of the long peninſula. Along this narrow ſlip of beach is the only way to paſs by land to Port Royal, for 9 or 10 miles, the careening place being almoſt at midway, but ſomewhat nearer to the eaſt end of the peninſula.—*ib.*

MERCHETTA, or *Marchetta Mulierum*, is commonly ſuppoſed to have been a right which, during the prevalence of the feudal ſyſtem, the lord had of paſſing the firſt night after marriage with his female villain. This opinion has been held by the greater part of our antiquarians; and we have adopted it in our hiſtory of Scotland publiſhed in the *Encyclopædia*. It appears, however, to be a miſtake. That there was a cuſtom called *merchetta mulierum*, which prevailed not only in England, Scotland, Wales, and the iſle of Guernſey, but alſo on the continent, is indeed a fact unqueſtionable; but Mr Aſtle has clearly proved, that, inſtead of being an adulterous connection, the *merchetta* was a compact between the lord and his vaſſal for the redemption of an *offence* committed by that vaſſal's *unmarried* daughter. He admits, however, that it denoted likewiſe a fine paid by a *ſokeman* or a *villain* to his lord, for a licence to marry his daughter to a free man; and that if the vaſſal gave her away without obtaining ſuch a licence, he was liable to pay a heavier fine. He quotes two authorities in ſupport of his opinion from Bracton; one of which we ſhall tranſcribe, as being alone complete evidence.

Archæologia, vol. xii.

"Ric. Burre tenet unum meſuagium et debet telliagium ſectam curiæ, et *merchet*, hoc modo, *quod ſi maritare voluerit filiam ſuam cum quodam libero homine, extra villam, faciet pacem domini pro maritagio, et ſi eam maritaverit alicui cuſtumario villæ, nihil debuit pro maritagio.*"

"The probable reaſon of the cuſtom (ſays Mr Aſtle) appears to have been this. Perſons of low rank, reſiding on an eſtate, were either *aſcripti glebæ*, or were ſubjected to ſome ſpecies of ſervitude ſimilar to the *aſcripti glebæ*. They were bound to reſide on the eſtate, and to perform ſeveral ſervices to the lord. As women neceſſarily followed the reſidence of their huſbands, the conſequence was, that when a woman of low rank married a ſtranger, the lord was deprived of part of his live ſtock; he therefore required a fine to indemnify him for the loſs of his property." Further particulars on the *merchetta* are to be found in the Appendix to vol. 1ſt of *Sir David Dalrymple's Annals of Scotland.*

MERCY, *Cape of God's*, the moſt ſoutherly point of Cumberland's Iſland, on the N. ſide of Cumberland's Straits, in lat. about 66° N. and has Cape Walſingham on its N. E. and Exeter Sound on its north.—*Morſe.*

MEREDITH, *Cape*, among the Falkland Iſlands in the S. Alantic Ocean, is between Port Stephen's and Cape Orford.—*ib.*

MEREDITH, a townſhip in Strafford county, New-Hampſhire, ſituated on the S. W. ſide of Lake Winipiſeogee, 15 miles N. of Gilmantown, 9 S. E. of Plymouth, and 70 N. W. of Portſmouth. It was incorporated in 1768. In 1775 it contained 259 and in 1790, 881 inhabitants. It was firſt called New-Salem.—*ib.*

MERIDA, the capital of Yucatan, in the audience of Mexico, in N. America. It lies near the N. ſide of the province, between the gulfs of Mexico and Honduras; 45 miles S. of the Ocean, and 135 N. E. of the city of Campeachy. N. lat. 21° 38′, W. long. 90° 36′.—*ib.*

Merida, a town of New Granada, in S. America, ſituated near the limits which divide the province from Venezuela. The ſoil round this place abounds with fruit of all ſorts, and there are gold mines near it. It is about 54 miles from Lake Maracaybo, 130 N. E. of Pampeluna, and 260 N. E. of St Fe. The inhabitants ſend their fruit and merchandize to Truxillo. N. lat. 8° 30′, W. long. 71°.—*ib.*

MERIDIAN Line, an arch, or part of the meridian of the place, terminated each way by the horizon. Or, a meridian line is the interſection of the plane of the meridian of the place with the plane of the horizon, often called a north-and-ſouth line, becauſe its direction is from north to ſouth.

In the article Astronomy *(Encycl.)*, nº 376 and 377, we have given two methods of drawing a meridian line; but it may be proper to add, in this place, the following improvement of the former of theſe from Dr Hutton's Mathematical Dictionary. "As it is not eaſy (ſays the Doctor) to determine preciſely the extremity of the ſhadow, it will be beſt to make the ſtile flat at the top, and to drill a ſmall hole through it, noting the lucid point projected by it on the ſeveral concentric circles, inſtead of marking the extremity of the ſhadow itſelf on theſe circles."

We ſhall give another method of drawing a meridian line from the ſame valuable dictionary.

Plate XXXVI.

"Knowing the ſouth quarter pretty nearly, obſerve the altitude FE of ſome ſtar on the eaſt ſide of it, and not far from the meridian HZRN: then, keeping the quadrant firm on its axis, ſo as the plummet may ſtill cut the ſame degree, direct it to the weſtern ſide of the meridian, and wait till you find the ſtar has the ſame altitude as before, as *fe*. Laſtly, biſect the angle EC*e*, formed by the interſection of the two planes in which the quadrant has been placed at the time of the two obſervations, by the right line HR, which will be the meridian ſought."

Magnetical Meridian, is a great circle paſſing thro' or by the magnetical poles; to which meridians the magnetical needle conforms itſelf. See Magnetism, *Suppl.*

MERIM, a large lake in Paraguay in S. America, very near the coaſt of the S. Atlantic Ocean, where the land is very flat. Fort St Miguel ſtands at the S. end, and Fort Mangaveira at its north-eaſtern extremity. There is a very narrow lake, parallel to Lake Merim between it and the ocean, and nearly as long. The forts command the extremities of the peninſula.—*Morse.*

MERIMEG, or *Marameg*, a large river of Louiſiana, which emties into the Miſſiſſippi, below the mouth of the Miſſouri, and 50 miles above the ſettlement of Genivieve. Fine meadows lie between this and the Miſſouri.—*ib.*

MERION, *Upper* and *Lower*, two townſhips in Montgomery county, Pennſylvania.—*ib.*

MERO DISTRICT, in the State of Tenneſſee, on the banks of Cumberland river. It comprehends the counties of Davidſon, Sumner, and Tenneſſee. In 1790 it contained 7,042 inhabitants, including 1,151 ſlaves. By the State cenſus of 1795 there were 14,390, of which number 2,466 were ſlaves —*ib.*

MERO POINT, in the S. Pacific Ocean and coaſt of Peru, between Cape Blanco to the S. W. and Tumbez river to the N. E. on the S. E. ſide of Guayaquil Bay, in lat. 3° 40′ S. The coaſt at the point of Mero is low and flat, but the country within is high and mountainous.—*ib.*

MERRIMACK *River*, has its courſe ſoutherly through the State of New-Hampſhire, till it enters Maſſachuſetts; it then turns eaſterly, and paſſes into the ocean at Newbury Port. This river is formed by the confluence of Pemigewaſſet and Winnipiſeogee rivers, in about lat. 43° 26′. This river is navigable for veſſels of burden about 20 miles from its mouth, where it is obſtructed by the firſt falls, or rapids, called Mitchell's Eddy, between Bradford and Haverhill. Vaſt quantities of ſhip-timber, and various kinds of lumber are brought down in rafts, ſo conſtructed as to paſs all the falls in the river except thoſe of Amuſkeag and Pawtucket. In the ſpring and ſummer, conſiderable quantities of ſalmon, ſhad and alewives are caught, which are either uſed as bait in the codfiſhery, or pickled, and ſhipped to the Weſt-Indies. As many as 6 or 7 bridges have been thrown over this fine river at different diſtances, from New-Concord, downwards; the moſt elegant and expenſive are the one two miles above Newbury-Port, and the one at Haverhill. A canal is now in proceſs to open a communication between the waters of the Merrimack at Chelmsford and the harbour of Boſton, through Myſtick river. The bar acroſs the mouth of this river is a very great incumbrance to navigation, and is eſpecially terrible to ſtrangers. There are 16 feet of water upon it at common tides. There are two light-houſes of wood, removeable at pleaſure, according to the ſhifting of the bar. The lights now bear E. ½ N. and W. ½ S. Bringing both the light-houſes to bear into one, until you are a breaſt of the lower one, will bring you in over the bar in the deepeſt water; where is a bold ſhore and good anchoring ground. The N. point of Plumb-Iſland which forms the S. ſide of the entrance into the river, lies in lat. 42° 47′ 40″.—*ib.*

Merrimack, a townſhip in Hillſborough county, New-Hampſhire, ſituated on the ſouth ſide of Souhegan river, which runs eaſtward into the Merrimack. It is 55 miles weſterly of Portſmouth, was incorporated in 1746, and contains 819 inhabitants.—*ib.*

MERRIMICHI *River* falls into the head of a bay of that name on the N. E. coaſt of the province of New-Brunſwick. A little above its confluence with the bay, it forms into two branches, and runs through a fertile tract of choice intervale land; and the land is, in general, well cloathed with timber of all kinds. From this river there is a communication with St John's, partly by land, but principally by water carriage in canoes. The ſalmon fiſhery is carried on with ſucceſs, and the cod fiſhery is improving near the entrance of the bay.—*ib.*

MERRY-MEETING *Bay*, in Strafford county, New-Hampſhire, is the ſouth-eaſternmoſt arm of Lake Winnipiſeogee. Mount Major ſtands on its weſt ſide.—*ib.*

Merry-Meeting *Bay*, in the Diſtrict of Maine, is formed by the junction of Androſcoggin and Kennebeck rivers, oppoſite to the town of Woolwich, 20 miles from the ſea. Formerly, from this bay to the ſea, the confluent ſtream was called Sagadahock. The lands here are good. Steven's river heads within a mile of the bay, and a canal has lately been opened which unites theſe waters. A company has been incorporated to build a bridge over Androſcoggin river, at its entrance into the bay, to connect the towns of Brunſwick and Topſham; the former on its ſouthern ſide, the latter on its northern ſide.—*ib.*

MERTEQUE, a town in the province of Honduras in New-Spain, which produces the cochineal.—*ib.*

MESA, *La*, the ſouthernmoſt of 4 iſles in the Pacific Ocean, near to each other, and E. of the Sandwich Iſles. N. lat. 19°, W. long. 137° 30′.—*ib.*

MESOLABE, or Mesolabium, a mathematical inſtrument invented by the ancients, for finding two mean proportionals mechanically, which they could not perform geometrically. It conſiſts of three parallelograms, moving in a groove to certain interſections. Its figure is deſcribed by Eutocius, in his Commentary on Archimedes. See alſo Pappus, lib. 3.

MESO-Logarithm, a term uſed by Kepler to ſignify the logarithms of the coſines and cotangents.

MESSASAGUES, Indians inhabiting between Lakes Superior and Huron. They have about 1,500 warriors.—*Morse.*

MESSERSBURG, a town in Franklin county, Pennſylvania, 16 miles S. W. of Chamberſburg, and 168 W. by S. of Philadelphia.—*ib.*

MESSILLONES, or *Muſcle Bay*, on the coaſt of Chili or Peru, in S. America, is 8 leagues N. by E. of Morrenas bay, and 5 S. by W. of Atacama. It is properly within the bay of Atacama, and is ſo deep on the S. ſide that there is no ſoundings; but at the entrance or anchoring place it is moderate, and ſhips may ride in 15 fathoms, clean ground, and ſecured from moſt winds.—*ib.*

MESTRE *Bay*, *Little*, on the N. E. part of Newfoundland Iſland, ſouthward of St Julian, and N. by W. of the iſlands Gros and Belle.—*ib.*

MESUCKAMA *Lake*, in the N. part of N. America. N. lat. 50° 10′, W. long. 80°.—*ib.*

MESURATA, a ſeaport of the kingdom of Tripoli, in Africa. A caravan proceeds from this place to Fezzan, and other interior parts toward the ſouth of

Africa. It is 260 miles north of Mourzook. E. lon. 15. 5. N. lat. 31. 3.

METALLIC TRACTORS. See PERKINISM in this *Suppl.*

METCHIGAMIAS, a long narrow lake, or rather dilatation of the northern branch of the river St Francis, in Louiſiana, which falls into the Miſſiſſippi from the N. W. about 4 miles above Kappas Old Fort.—*Morse.*

METHUEN, the north-weſternmoſt townſhip in Eſſex county, Maſſachuſetts, ſituated on the N. bank of Merrimack river, between Dracut and Haverhill. It contains 2 pariſhes and 1,297 inhabitants. It was incorporated in 1725. Huſbandry and the cutting and ſelling lumber divide the attention of the inhabitants. —*ib.*

METONIC CYCLE, called alſo the *Golden Number*, and *Lunar Cycle*, or *Cycle of the Moon*, that which was invented by Meton the Athenian; being a period of 19 years. See CYCLE, *Encycl.*

MEW *Iſlands*, on the coaſt of the Spaniſh Main in the Weſt-Indies, between Cape Cameron, and Cape Gracias a Dios, lie acroſs the entrance into the bay of Cotroe, or Crotoe. They are ſurrounded with rocks, and are very dangerous, eſpecially in caſe of hard guſts, from the N. and N. E.—*Morse.*

MEXICANO *River*, or *Adayes*, in Louiſiana, has a S. E. courſe and empties into the Gulf of Mexico, at Cabo du Nord; W. by S. of Aſcenſion bay, and E. by N. of the mouth of Trinity river. On its banks are rich ſilver mines: Fort Adayes ſtands on its north-eaſtern ſide, in about lat. 30° 31′ north.—*ib.*

MEXICO, a townſhip in Herkemer county, New-York, incorporated in 1796, lying on Canada and Wood Creeks, and Oneida Lake.—*ib.*

MEXICO, or *New-Spain*, bounded north by unknown regions, eaſt by Louiſiana and the gulf of Mexico, ſouth by the Iſthmus of Darien, which ſeparates it from Terra Firma in South-America, weſt by the Pacific Ocean. Its length is about 2,100 miles, its breadth 1600; ſituated between lat. 9° and 40° north, and between long. 83° 8′ and 125° 8′ weſt. This vaſt country is divided into *Old-Mexico*, which contains the audiences of Galicia, Mexico, and Gautimala, which are ſubdivided into 22 provinces; *New-Mexico*, divided into two audiences, Apacheria and Sonora; and *California*, on the weſt, a peninſula. The land is in great part abrupt and mountainous, covered with thick woods, and watered with large rivers. Some of theſe run into the Gulf of Mexico, and others into the Pacific Ocean. Among the firſt are Alvarado, Coatzacualco, and Tabaſco. Among the latter is the river Guadalaxara or Great river. There are ſeveral lakes which do not leſs embelliſh the country than give convenience to the commerce of the people. The lakes of Nicaragua, Chapallan, and Pazaquaro, are among the largeſt. The lakes Tezcuco and Chalco occupy a great part of the vale of Mexico, which is the fineſt tract of country in New-Spain. The waters of Chalco are ſweet, thoſe of Tezcuco are brackiſh. A canal unites them. The lower lake (Tezcuco) was formerly as much as 20 miles long and 17 broad, and, lying at the bottom of the vale, is the reſervoir of all the waters from the ſurrounding mountains. The city of Mexico ſtands on an iſland in this lake.

In this country are interſperſed many fountains of different qualities. There are an infinity of nitrous, ſulphureous, vitriolic, and alluminous mineral waters, ſome of which ſpring out ſo hot, that in a ſhort time any kind of fruit or animal food is boiled in them. There are alſo petrifying waters, with which they make little white, ſmooth ſtones, not diſpleaſing to the taſte; ſcrapings from which taken in broth, or in gruel, made of Indian corn, are moſt powerful diaphoretics, and are uſed with remarkable ſucceſs in various kinds of fevers.

The climate of this extenſive country is various. The maritime parts are hot, and for the moſt part moiſt and unhealthy. Lands, which are very high, or very near to high mountains, which are perpetually covered with ſnow, are cold.

The mountains of Mexico abound in ores of every kind of metal, and a great variety of foſſils. There are entire mountains of loadſtone, and among others, one very conſiderable between Coiltytlan and Chilapan, in the country of the Cohuixcas.

However plentiful and rich the mineral kingdom of Mexico may be, the vegetable kingdom is ſtill more various and abundant. Dr Hernandez, deſcribes in his natural hiſtory, about 1,200 medicinal plants, natives of that country. The fruits of Mexico are, pine-apples, plums, dates, water-melons, apples, peaches, quinces, apricots, pears, pomegranates, figs, black-cherries, walnuts, almonds, olives, cheſnuts, and grapes. The cocoa-nut, vanilla, chia, great-pepper, tomati, the pepper of Tabaſco, and cotton, are very common with the Mexicans. Wheat, barley, peas, beans and rice have been ſucceſsfully cultivated in this country. With reſpect to plants which yield profitable reſins, gums, oils or juices, the country of Mexico is ſingularly fertile. Of quadrupeds, there have been tranſported into this country horſes, aſſes, bulls, ſheep, goats, hogs, dogs and cats, which have all multiplied. Of the ancient quadrupeds, by which is meant thoſe that from time immemorial have been in that country, ſome are common to both the continents of Europe and America, ſome peculiar to the new world, others natives only of the kingdom of Mexico. The ancient quadrupeds common to Mexico and the old continents, are lions, tigers, wild-cats, bears, wolves, foxes, the common ſtags and white ſtags, bucks, wild-goats, badgers, pole-cats, weazles, martins, ſquirrels, rabbits, hares, otters and rats. Their prodigious number of birds, their variety, and many valuable qualities, have occaſioned ſome authors to obſerve, that as Africa is the country of beaſts, ſo Mexico is the country of birds. It is ſaid there are 200 ſpecies peculiar to that kingdom.

The civil government of Mexico is adminiſtered by tribunals called audiences. In theſe courts, the viceroy of the king of Spain preſides. His employment is the greateſt truſt and power his Catholic Majeſty has at his diſpoſal, and is perhaps the richeſt government entruſted to any ſubject in the world. The viceroy continues in office three years. The clergy are extremely numerous in Mexico. The prieſts, monks and nuns of all orders make a fifth of the white inhabitants, both here and in other parts of Spaniſh America. The empire of Mexico was ſubdued by Cortez in 1521.—*ib.*

MEXICO, the capital of the above province, is the oldeſt city in America, of which we have any account; its foundation being dated as far back as 1325. It is ſituated in the charming vale of Mexico, on ſeveral ſmall iſlands, in Lake Tetzcuco, in N. lat. 19° 26′, and 103° 35′ W. long. from Ferro. This vale is ſurrounded with lofty and verdant mountains, and formerly contained no leſs than 40 eminent cities, beſides villages and hamlets. Concerning the ancient population of this city there are various opinions. The hiſtorians moſt to be relied on ſay, that it was nearly nine miles in circumference; and contained upwards of 60,000 houſes, containing each from 4 to 10 inhabitants. By a late accurate enumeration, made by the magiſtrates and prieſts, it appears that the preſent number of inhabitants exceeds 200,000. The greateſt curioſity in the city of Mexico, is their floating gardens. When the Mexicans, about the year 1325, were ſubdued by the Colhuan and Tepanecan nations, and confined to the ſmall iſlands in the lake, having no land to cultivate, they were taught by neceſſity to form moveable gardens, which floated on the lake. Their conſtruction is very ſimple. They take willows and the roots of marſh plants, and other materials which are light, and twiſt them together, and ſo firmly unite them as to form a ſort of platform, which is capable of ſupporting the earth of the garden. Upon this foundation they lay the light buſhes which float on the lake, and over them ſpread the mud and dirt which they draw up from the bottom of the lake. Their regular figure is quadrangular; their length and breadth various, but generally about 8 rods long and 3 wide; and their elevation from the ſurface of the water is leſs than a foot. Theſe were the firſt fields that the Mexicans owned, after the foundation of Mexico; there they firſt cultivated the maize, great-pepper, and other plants neceſſary for their ſupport. From the induſtry of the people theſe fields ſoon became numerous. At preſent they cultivate flowers and every ſort of garden herbs upon them. Every day of the year at ſunriſe, innumerable veſſels or boats, loaded with various kinds of flowers and herbs, which are cultivated in theſe gardens, are ſeen arriving by the canal, at the great market-place of Mexico. All plants thrive in them ſurpriſingly; the mud of the lake makes a very rich ſoil, which requires no water from the clouds. In the largeſt gardens there is commonly a little tree and a little hut to ſhelter the cultivator and defend him from the rain or the ſun. When the owner of a garden or the *Chinampa* as it is called, wiſhes to change his ſituation, to get out of a bad neighbourhood, or to come nearer to his family, he gets into his little boat, and by his own ſtrength alone, if the garden is ſmall, or with the aſſiſtance of others, if it is large, conducts it wherever he pleaſes, with the little tree and hut upon it. That part of the iſland where theſe floating gardens are, is a place of delightful recreation, where the ſenſes receive the higheſt poſſible gratification. The buildings, which are of ſtone, are convenient, and the public edifices, eſpecially the churches, are magnificent; and the city has the appearance of immenſe wealth. The trade of Mexico conſiſts of 3 great branches, which extend over the whole world. It carries on a traffic with Europe, by La Vera Cruz, ſituated on the Gulf of Mexico, or North Sea; with the Eaſt-Indies, by Acapulco, on the South Sea, 210 miles S. W, of Mexico; and with South-America, by the ſame port. Theſe two ſea-ports, Vera Cruz and Acapulco, are admirably well ſituated for the commercial purpoſes to which they are applied.—*ib.*

MHA RAJAH, the higheſt title of Hindoos.

MIAMI *River, Little,* in the N. W. Territory, has a ſouth-weſtern courſe, and empties into the Ohio, on the eaſt ſide of the town of Columbia, 20 miles eaſtward of the Great Miami, in a ſtraight line, but 27 taking in the meanders of the Ohio. It is too ſmall for batteaux navigation. Its banks are good land, and ſo high as to prevent in common the overflowing of the water. At the diſtance of 30 miles from the Ohio, the Miamies approximate each other within eight miles and a half. On this river are ſeveral ſalt-ſprings.—*Morse.*

MIAMI *River, Great,* or *Great Mincami,* called alſo *Aſſereniet,* or Rocky river, in the N. W. Territory, has a S. by W. courſe, and empties into the Ohio by a mouth 200 yards wide, 32½ miles from Big Bones, 154 miles from the Rapids, and 604 from the mouth of the Ohio. It is one of the moſt beautiful ſtreams in the Territory, and is ſo clear and tranſparent, at its higheſt ſtate, that a pin may very plainly be ſeen at its bottom. It has a very ſtony channel, a ſwift ſtream, but no falls. At the Picque or Pickawee towns, above 75 miles from its mouth, it is not above 30 yards broad, yet loaded batteaux can aſcend 50 miles higher. The portage from the navigable waters of its eaſtern branch to Sanduſky river is 9 miles, and from thoſe of its weſtern branch to the Miami of the Lakes, only 5 miles. It alſo interlocks with the Scioto.—*ib.*

MIAMI *of the Lakes,* a navigable river of the N. W. Territory, which falls into Lake Erie, at the S. W. corner of the lake. A ſouthern branch of this river communicates with the Great Miami, by a portage of 5 miles. This river is called by ſome writers Mawmee, alſo Omee, and Manmick.—*ib.*

MIAMI, a village on the Miami of the Lake near the Miami Fort. Large canoes can come from Ouiatanon, a ſmall French ſettlement on the W. ſide of the Wabaſh, 197 miles below the Miami Carrying-place, which laſt is 9 miles from this village.—*ib.*

MIAMIS, an Indian nation who inhabit on the Miami river and the ſouthern ſide of Lake Michigan. They can raiſe about 300 warriors. In conſequence of lands ceded to the United States by the treaty of Greenville, Auguſt 3d 1795, government paid them a ſum in hand, and engaged to pay to them annually, forever, to the value of 1,000 dollars in goods.—*ib.*

MIAMIS *Bay,* at the mouth of the Miami of the Lakes.—*ib.*

MIATA *Iſland,* one of the Society Iſlands, in the S. Pacific ocean. S. lat. 17° 52′, W. long. 148° 6′.—*ib.*

MICHAEL, *St,* or *St Miguel,* a town in the province of Quito, in Peru, and ſaid to be the firſt town the Spaniards built in that country. It is of conſiderable ſize, ſtanding in a fruitful valley, about 20 leagues from the ſea. The inhabitants call it Chila. Another town, called St Miguel, is the ſecond city in Tucumania, 20 leagues from St Jago del Eſtero, on the road to Charcara or Potoſi, at the foot of a range of rugged mountains, in a well watered place, having

the

Michael, || Michillimakkinak.

the river Quebrada on the one ſide, and ſeveral ſmall ſtreams on the other, 5 or 6 leagues from it. The country produces all kinds of grain, plenty of grapes, cotton and flax, and yields excellent paſturage.—*ib.*

MICHAEL, *St*, a town of N. America, in New-Spain, and in the province of Mechoacan. It is very populous, and 100 miles from Mexico. N. lat. 20° 35′, W. long. 102° 55′.—*ib.*

MICHAEL'S *Bay, St*, on the E. ſide of the iſland of Barbadoes, in the Weſt-Indies; a little N. of Foul's Bay; N. E. of which laſt bay are Cobler's Rocks, in the ſhape of a horn.—*ib.*

MICHAEL'S *Gulf, St*, in the S. E. part of Panama Bay, is formed by the outlet of St Maria and other rivers that fall into it.—*ib.*

MICHAEL, *St*, or *St Miguel River*, is alſo on the S. coaſt of the iſthmus between N. and S. America, and on the N. Pacific ocean, and 18 leagues to the W. of Port Martin Lopez, and 3 E. of Guibaltigue. It has 3 fathoms water at flood. Within the river to the N. E. is the burning mountain of St Miguel, in the midſt of an open plain.—*ib.*

MICHAEL'S *Bay, St*, in Terra Firma, on the S. Sea.—*ib.*

MICHAEL'S, *St*, a pariſh in Charleſton diſtrict, S. Carolina.—*ib.*

MICHAEL'S, *St*, a town in Talbot county, Maryland, 8 miles W. of Eaſton, and 21 S. E. of Annapolis.—*ib.*

MICHAEL, *St*, or *Fond des Negre*, a town on the S. peninſula of St Domingo iſland, 10 leagues N. E. of St Louis.—*ib.*

MICHIGAN *Lake*, in the N. W. Territory, is the largeſt and moſt conſiderable lake, which is wholly within the United States, and lies between lat. 42° 10′ and 45° 40′ N. and between 84° 30′ and 87° 30′ W. long. Its computed length is 280 miles from north to ſouth; its breadth from 60 to 70 miles, and its circumference nearly 600 miles; and contains, according to Mr Hutchins, 10,368,000 acres. It is navigable for ſhipping of any burden; and communicates with Lake Huron, at the north-eaſtern part, through the Straits of Michillimakkinak. The ſtrait is 6 miles broad, and the fort of its name ſtands on an iſland at the mouth of the ſtrait. In this lake are ſeveral kinds of fiſh; particularly trout of an excellent quality, weighing from 20 to 60 pounds; and ſome have been taken in the ſtrait which weighed 90 pounds. On the N. W. parts of this lake, the waters puſh through a narrow ſtrait, and branch out into two bays; that to the northward is called Noquet's Bay, the other to the ſouthward, Puans, or Green Bay, which laſt with the lake, forms a long peninſula, called Cape Townſend, or Vermillion Point. About 30 miles S. of Bay de Puans, is Lake Winnebago, which communicates with it: and a very ſhort portage interrupts the water communication, ſouth-weſtward from Winnebago Lake through Fox river, then through Ouiſconſin, into the river Miſſiſſippi. Chicago river, alſo at the S. W. extremity of Lake Michigan, furniſhes a communication interrupted by a ſtill ſhorter portage, with Illinois river. Lake Michigan receives many ſmall rivers from the W. and E. ſome 150 and even 250 yards broad at their mouths.—*ib.*

MICHILLIMAKKINAK *Straits* connect Lakes Michigan and Huron, in a N. E. and S. W. courſe.—*ib.*

Michillimakkinak, || Mickmacks.

MICHILLIMAKKINAK, an iſland, fort, and village on the S. W. ſide of the ſtraits of the ſame name. The ſmall iſle on which the village, and the fort commanding the ſtrait, ſtand, is W. N. W. of White Wood Iſland, in Lake Huron. In addition to the lands round this poſt to which the Indian title had been extinguiſhed by the French and Britiſh governments, the Indians have ceded by the treaty of Greenville, a tract of land on the main, to the north of the iſland on which the poſt of Michillimakkinak ſtands, to meaſure 6 miles on lakes Huron and Michigan, and to extend 3 miles back from the water of the lake or ſtrait, and alſo De Bois Blanc, or White Wood Iſland. This laſt was the voluntary gift of the Chipewa nation. The iſland of Michillimakkinak is very barren, but, as it is the grand rendezvous of the Indian traders, a conſiderable trade is carried on; and its very advantageous ſituation ſeems to enſure that it will be, at ſome future period, a place of great commercial importance. It is within the line of the United States, and was lately delivered up by the Britiſh. It is about 200 miles N. N. W. from Detroit, and 974 N. W. of Philadelphia. N. lat. 45° 20′, W. long. 84° 30′.—*ib.*

MICHILLIMAKKINAK, *Little*, a river in the N. W. Territory, which enters the ſouth-eaſtern ſide of Illinois river, by a mouth 50 yards wide, and has between 30 and 40 ſmall iſlands at its mouth; which at a diſtance appear like a ſmall village. It runs a N. W. courſe, and is navigable about 90 miles. On its banks is plenty of good timber, viz. red and white cedar, pine, maple, walnut, &c. as alſo coal mines. Its mouth is 13 miles below the Old Piorias Fort and village, on the oppoſite ſide of the river, at the S. W. end of Illinois Lake, and 195 miles from the Miſſiſſippi.—*ib.*

MICHIPICOTEN, a river which empties into Lake Superior, on the north-eaſt ſide of the lake. It has its ſource not far diſtant from Mooſe river, a water of James's Bay. It forms at its mouth a bay of its own name; and on the W. part of the bay, is a large iſland ſo called, cloſe to the land, a ſmall ſtrait only ſeparates it from Otter's Head on the north.—*ib.*

MICHIPICOOTON *Houſe*, in Upper Canada, is ſituated on the E. ſide of the mouth of the above river, in lat. 47° 56′ N. and belongs to the Hudſon Bay Company.—*ib.*

MICHISCOUI is the Indian and preſent name of the moſt northerly river in Vermont. It riſes in Belvidere, and runs nearly north-eaſt until it has croſſed into Canada, were it runs ſome diſtance, it turns W. then ſoutherly, re-enters the State of Vermont in Richford, and empties into Lake Champlain, at Michiſcoui Bay, at Highgate. It is navigable for the largeſt boats to the falls at Swantown, 7 miles from its mouth. Michiſcoui, La Moelle, and Onion rivers, are nearly of the ſame magnitude.—*ib.*

MICHISCOUI *Tongue*, or *Bay*, a long point of land which extends ſoutherly into Lake Champlain from the north-eaſt corner of the State of Vermont on the W. ſide of the bay of this name, and forms the townſhip of Allburg.—*ib.*

MICKMACKS, an Indian nation which inhabit the country between the Shapody Mountains, and the

Gulf of St Lawrence in Nova-Scotia, oppoſite to St John's Iſland. This nation convey their ſentiments by hieroglyphics marked on the rind of the birch and on paper, which the Roman miſſionaries perfectly underſtand. Many of them reſide at the heads of the rivers, in King's and Hants counties.—*ib.*

MICOYA *Bay* is ſituated on the S. W. coaſt of Mexico, or New-Spain, on the North Pacific Ocean. In ſome charts it is laid down in lat. 10° 15′ N. and having Cape Blanco and Chira Iſland for its ſouth-eaſt limit.—*ib.*

MICROCOUSTICS, or MICROPHONES, inſtruments contrived to magnify ſmall ſounds, as microſcopes do ſmall objects.

MICROCOSMIC SALT. See CHEMISTRY-*Index*, *Suppl.*

MIDDLE BANK, a fiſhing ground in the Atlantic Ocean, which lies from north-eaſt to ſouth-weſt, between St Peter's Bank and that of Sable Iſland; and oppoſite to, and S. E. of Cape Breton Iſland, laid down in ſome charts between lat. 44° 32′, and 45° 34′ N. and between long. 57° 37′, and 59° 32′. —*Morſe.*

MIDDLEBOROUGH, the *Namaſkett* of the ancient Indians, a townſhip in Plymouth county, Maſſachuſetts, bounded weſt by Freetown and Taunton, eaſt by Carver and Warham, and is 40 miles S. by E. of Boſton; was incorporated in 1669, and contains 4,526 inhabitants. This town was formerly thickly inhabited by Indian natives, governed by the noted ſachem *Tiſpacan:* there are now only 30 or 40 ſouls remaining, who, to ſupply their immediate neceſſities, make and ſell brooms and baſkets. The town is remarkable for a large range of ponds, which produce ſeveral ſorts of fiſh, and large quantities of iron ore. The bottom of Aſſowamſet Pond may be ſaid to be an entire mine of iron ore. Men go out with boats, and uſe inſtruments like oyſter dredges, to get up the ore from the bottom of the pond. It is now ſo much exhauſted, that half a ton is thought a good day's work for one man; but for a number of years one man could take up four times the quantity. In an adjacent pond there is yet great plenty at 20 feet deep, as well as from ſhoaler water. Great quantities of nails are made here. In winter, the farmers and young men are employed in this manufacture. Here, and at Milton in Norfolk county, the firſt rolling and ſlitting mills were erected about 40 years ago, but were imperfect and unproductive, in compariſon with thoſe of the preſent time. The prints of naked hands and feet are to be ſeen on ſeveral rocks in this town, ſuppoſed to have been done by the Indians. Theſe are probably ſimilar to thoſe obſerved in the States of Tenneſſee and Virginia.—*ib.*

MIDDLEBOURG *Key*, a ſmall iſlot ſeparated from St Martin's in the Weſt-Indies on the N. E.—*ib.*

MIDDLEBURG, or *Eooa*, the moſt ſoutherly of all the Friendly Iſlands, in the South Pacific Ocean; and is about 10 leagues in circuit.—*ib.*

MIDDLEBURY, a poſt-town of Vermont, and capital of Addiſon county. It is 33 miles N. by W. of Rutland, 15 from Vergennes, and 37 S. E. of Burlington. Here is a brewery upon a pretty large ſcale. The townſhip lies on the E. ſide of Otter Creek, and contains 395 inhabitants.—*ib.*

MIDDLE *Cape* is to the S. W. of Cape Anthony, in Staten Land, on the ſtrait Le Maire, and the moſt weſterly point of that iſland; at the extremity of S. America.—*ib.*

MIDDLEFIELD, a townſhip in Hampſhire county, Maſſachuſetts, 30 miles N. W. of Springfield, and 125 miles weſterly of Boſton. It was incorporated in 1783, and contains 608 inhabitants.—*ib.*

MIDDLEHOOK, a village in New-Jerſey, 8 miles W. of Brunſwick, on the croſs poſt-road from Brunſwick to Flemington, and on the N. bank of Rariton river.—*ib.*

MIDDLE *Iſlands*, or *Ihlas de en Medio*, on the W. coaſt of New-Mexico, and are between the iſlands of Chira and St Luke. They are in the North Pacific ocean, in lat. 9° 30′ N. There is only from 6 to 7 fathoms from Chira to theſe iſlands, and all veſſels ſhould keep nearer to them than to the main.—*ib.*

MIDDLE LATITUDE, is half the ſum of two given latitudes; or the arithmetical mean, or the middle between two parallels of latitude. Therefore,

If the latitudes be of the ſame name, either both north or both ſouth, add the one number to the other, and divide the ſum by 2; the quotient is the middle latitude, which is of the ſame name with the two given latitudes. But

If the latitudes be of different names, the one north and the other ſouth; ſubtract the leſs from the greater, and divide the remainder by 2, ſo ſhall the quotient be the middle latitude, of the ſame name with the greater of the two.

MIDDLESEX, a county of Maſſachuſetts, bounded north by the State of New-Hampſhire, E. by Eſſex county, S. by Suffolk, and W. by Worceſter county. Its figure is nearly equal to a ſquare of 40 miles on a ſide; its greateſt length being 52, and its greateſt breadth 42 miles. It has 42 townſhips, which contain 42,737 inhabitants. The religious ſocieties are 55 of Congregationaliſts, 6 of Baptiſts, and ſome Preſbyterians. It was made a county in 1643. It is watered by five principal rivers, Merrimack, Charles, Concord, Naſhua, and Myſtick; beſides ſmaller ſtreams. The chief towns are Charleſtown, Cambridge, and Concord. Charleſtown is the only ſea-port in the county; Concord is the moſt reſpectable inland town, and is near the centre of the county, being 20 miles N. W. of Boſton. There are in the county 24 fulling-mills, about 70 tan-yards, 4 paper-mills, 2 ſnuff-mills, 6 diſtilleries, and about 20 pot and pearl aſh houſes. The ſouthern and northern ſides of the county are hilly, but not mountainous, few of the hills exceeding 100 feet in height, and are covered with wood, or cultivated quite to their ſummits. The air is generally ſerene, and the temperature mild. The extreme variation of Farenheit's thermometer, may be conſidered as 100° in a year; but it is in very few inſtances, that in the courſe of a year it reaches either extreme: 92° may be conſidered as the extreme ſummer heat, and 5 or 6° below 0, as that of the winter cold. In the winter of 1796—1797, it ſunk to 11° below 0. The ſoil is various, in ſome parts of rich, black loam, and in others it is light and ſandy. It produces the timber, grain and fruit which are common throughout the State, either by natural growth or cultivation. —*Morſe.*

MIDDLESEX, a maritime county of Connecticut, bounded north by Hartford county, ſouth by Long-Iſland Sound, eaſt by New-London county, and weſt by New-Haven. Its greateſt length is about 30 miles, and its greateſt breadth 19 miles. It is divided into 6 townſhips, containing 18,855 inhabitants, of whom 221 are ſlaves. Connecticut river runs the whole length of the county, and on the ſtreams which flow into it are a number of mills. Middleton is the chief town.—*ib.*

Middlesex, a county of New-Jerſey, bounded north by Eſſex, N. W. and W. by Somerſet, S. W. by Burlington, S. E. by Monmouth, eaſt by Rariton Bay and part of Staten Iſland. It contains 15,956 inhabitants, including 1,318 ſlaves. From the mouth of Rariton river up to Brunſwick, the land on both ſides is generally good, both for paſture and tillage, producing conſiderable quantities of every kind of grain and hay. Chief town, New-Brunſwick.—*ib.*

Middlesex, a county of Virginia, on the ſouth ſide of Rappahannock river, on Cheſapeak Bay. It is about 35 miles in length, and 7 in breadth, containing 4,140 inhabitants, including 2,558 ſlaves. Urbanna is the chief town.—*ib.*

Middlesex, a townſhip in Chittendon county, Vermont, on the north-eaſt ſide of Onion river. It contains 60 inhabitants.—*ib.*

Middlesex *Canal* (Maſſachuſetts) it is expected will be of great importance to the States of Maſſachuſetts and New-Hampſhire. It is now opening at a vaſt expenſe by an incorporated company. The deſign is to open a water communication from the waters of Merrimack river at Chelmsford to the harbour of Boſton. The route of the canal will be ſoutherly through the eaſt parts of Chelmsford, and Billerica, the weſt part of Wilmington, and the middle of Woburn; where it comes to ſome ponds, from which the waters run by Myſtick river into Boſton harbour. The diſtance from the Merrimack to theſe ponds will be 17 miles. The canal will, without meeting with any large hills or deep vallies, be ſtraighter than the country road near it. The diſtance from the Merrimack to Medford, as the canal will be made, is 27, and to Boſton, 31 miles. The canal is to be 24 feet wide at the bottom, and 32 at the top, and 6 feet deep. The boats are to be 12 feet wide and 70 feet long. The toll is to be 6 cents a mile for every ton weight which ſhall paſs, beſides pay for their boats and labour.—*ib.*

MIDDLE STATES, one of the Grand Diviſions of the United States, (ſo denominated in reference to the northern and ſouthern States) comprehending the States of New-York, New-Jerſey, Pennſylvania, Delaware, and the Territory N. W. of the Ohio.—*ib.*

MIDDLETON, an interior townſhip in Eſſex county, Maſſachuſetts, 28 miles northerly of Boſton. It was incorporated in 1728, and contains 682 inhabitants.—*ib.*

Middleton, a city and poſt-town of Connecticut, and the capital of Middleſex county, pleaſantly ſituated on the weſtern bank of Connecticut river, 31 miles from its mouth at Saybrook Bar, according to the courſe of the river; 14 miles S. of Hartford, 26 N. by E. of New-Haven, 40 N. W. by W. of New-London, and 209 N. E. of Philadelphia. Its public buildings are, a Congregational church, an Epiſcopalian church, a court-houſe and naval-office. It contains about 300 houſes, and carries on a conſiderable trade. Here the river has 10 feet water at full tides. N. lat. 41° 35′, W. long. 77° 12′. This place was called *Mattabeſick*, by the Indians, and was ſettled in 1650 or 1651. Two miles from the city is a lead mine which was wrought during the war, and was productive; but it is too expenſive to be worked in time of peace.—*ib.*

MIDDLETOWN, a townſhip in Strafford county, New-Hampſhire; about 40 miles N. by N. W. of Portſmouth. It was incorporated in 1778, and contains 617 inhabitants.—*ib.*

Middletown, a townſhip in Rutland county, Vermont. It contains 699 inhabitants, and is 39 miles north of Bennington.—*ib.*

Middletown, a village on Long-Iſland, New-York State; 12 miles from Smithtown, and 13 from Bridgehampton.—*ib.*

Middletown, a townſhip in Ulſter county, New-York, erected from Rocheſter and Woodſtock in 1789, and contains 1,019 inhabitants, including 6 ſlaves. In 1796 there were 135 of the inhabitants entitled to be electors.—*ib.*

Middletown, a townſhip in Newport county, Rhode-Iſland State, contains 840 inhabitants, including 15 ſlaves. In this town which is on the iſland which gives name to the State, and about 2 miles from Newport, is the large and curious cavity in the rocks, called *Purgatory*.—*ib.*

Middletown, a ſmall poſt-town in Newcaſtle county, Delaware, lies on Apoquinimy Creek, 21 miles S. S. W. of Wilmington, and 49 S. W. of Philadelphia.—*ib.*

Middletown, in Monmouth county, New-Jerſey, a townſhip which contains two places of worſhip, one for Baptiſts and one for the Dutch Reformed church, and 3,226 inhabitants, including 491 ſlaves. The centre of the townſhip is 50 miles E. by N. of Trenton, and 30 S. W. by S. of New-York city. The light-houſe built by the citizens of New-York on the point of Sandy Hook, is in this townſhip. The high lands of Naveſink, are on the ſea-coaſt, near Sandy Hook. They are 600 feet above the ſurface of the water, and are the lands firſt diſcovered by mariners on this part of the coaſt.—*ib.*

Middletown *Point*, in the above townſhip, lies on the S. W. ſide of the bay within Sandy Hook, 9 miles E. by N. of Spotſwood, and 14 north-weſt of Shrewſbury. A poſt-office is kept here.—*ib.*

Middletown, a flouriſhing town in Dauphin county, Pennſylvania, ſituated on the N. W. ſide of Swatara creek, which empties into the Suſquehannah, 2 miles below. It contains a German church and above 100 houſes, and carries on a briſk trade with the farmers in the vicinity. It is eſtimated that above 200,000 buſhels of wheat are brought down theſe rivers annually to the landing place, 2 miles from the town. Contiguous to the town is an excellent merchant mill, ſupplied with a conſtant ſtream, by a canal cut from the Swatara. It is 6 miles S. of Hummelſton, and 92 W. by N. of Philadelphia. N. lat. 40° 12′, W. long. 76° 44′. There are alſo two other townſhips of this name in the State; the one in Delaware county, the other in that of Cumberland.—*ib.*

Middletown, in Frederick county, Maryland, lies nearly 8 miles W. N. W. of Frederickſtown.—*ib.*

MIDDLETOWN, in Dorcheſter county, Maryland, is about 5 miles N. of the Cedar Landing Place, on Tranſquaking Creek; 7 weſterly of Vienna, and 8½ N. W. of Cambridge.—*ib.*

MIDSUMMER-DAY, is held on the 24th of June, the ſame day as the nativity of St John the Baptiſt is held.

MIDWAY, a village in Liberty county, Georgia, 30 miles ſouth of Savannah, and 10 miles N. W. of Sunbury. Its inhabitants are Congregationaliſts, and are the deſcendants of emigrants from Dorcheſter near Boſton, in New-England, who migrated as early as 1700.—*Morse.*

MIDWAY, a townſhip in Rutland county, Vermont, eaſt of and adjoining Rutland.—*ib.*

MIFFLIN, a county of Pennſylvania, ſurrounded by Lycoming, Franklin, Cumberland, Northumberland, Dauphin, and Huntingdon counties. It contains 1,851 ſquare miles, 1,184,960 acres, and is divided into 8 townſhips. The mountains in this county abound with iron ore, for the manufacturing of which, ſeveral forges have been erected. It is well watered by the Juniatta, and other ſtreams which empty into the Suſquehannah. Chief town, Lewiſtown.—*ib.*

MIFFLIN, a ſmall town lately laid out in the above county, on the eaſt ſide of the Juniatta; 12 miles eaſt of Lewiſtown, and 138 from Philadelphia.—*ib.*

MIFFLIN, *Fort*, in Pennſylvania, is ſituated on a ſmall iſland, at the mouth of Schuylkill river, about 6 miles ſouth of Philadelphia.—*ib.*

MILFIELD, in Grafton county, New-Hampſhire, ſettled 1774.—*ib.*

MILFORD, a townſhip in Mifflin county, Pennſylvania.—*ib.*

MILFORD, a poſt-town of the State of Delaware, pleaſantly ſituated on the north ſide of Muſpillion Creek, about 12 miles weſt of its mouth in Delaware Bay, 19 S. by E. of Dover, 7 ſouth of Frederica, and 95 S. by W. of Philadelphia. It contains nearly 100 houſes, all built ſince the war, except one. The inhabitants are Epiſcopalians, Quakers and Methodiſts.—*ib.*

MILFORD, a town of Northampton county, Pennſylvania, lately laid out on the N. W. ſide of the Delaware, on a lofty ſituation, at Well's Ferry, 120 miles above Philadelphia. In front of the town, which contains as yet only a few houſes, the river forms a cove well fitted for ſheltering boats and lumber in ſtorms, or freſhes in the river. A ſaw-mill and paper-mill have been erected here; the latter belongs to Mr Biddis, who has diſcovered the method of making paper and paſte board, by ſubſtituting a large proportion of ſaw-duſt in the compoſition.—*ib.*

MILFORD, a poſt-town of Connecticut, on Long-Iſland ſound, and in New-Haven county, 13 miles S. W. of New-Haven, and eaſt of Stratford. The mouth of the creek on which it ſtands has 3 fathoms water. This town was called *Wopowage* by the Indians, and was ſettled in 1638. It contains an Epiſcopal church, and 2 Congregational churches.—*ib.*

MILFORD *Haven*, a deep bay on the coaſt of Nova Scotia, to the S. W. round the point of the ſtrait of Canſo. It receives ſeveral rivers from the N. W. and S. W.—*ib.*

MILITARY *Townſhips*, in the State of New-York. The legiſlature of the State granted one million and a half acres of land, as a gratuity to the officers and ſoldiers of the line of this State. This tract, forming the new county of Onondago, is bounded W. by the eaſt ſhore of the Seneca Lake, and the Maſſachuſetts lands in the new county of Ontario; N. by the part of Lake Ontario near Fort Oſwego; S. by a ridge of the Alleghany Mountains and the Pennſylvania line; and E. by the Tuſcarora Creek (which falls nearly into the middle of the Oneida Lake) and that part of what was formerly Montgomery county, which has been ſettling by the New-England people very rapidly ſince the peace. This pleaſant county is divided into 25 townſhips of 60,000 acres each, which are again ſubdivided into 100 convenient farms, of 600 acres; making in the whole 2,500 farms. This tract is well watered by a multitude of ſmall lakes and rivers.

The reſerved lands emboſomed in this tract, are as follow: a tract about 171 miles long, and 10 broad, including the northern part of the lake Cayuga, which lies in the centre of it, to the Cayuga Indians. The Indians have a village on each ſide of the lake; and the ferry at the north end lies in lat. 42° 54′ 14″ north. Connoga Caſtle is about 3 miles ſouth of the ferry, on the eaſt ſide of Lake Cayuga. The Onondago Reſervation is uniformly 11 miles long, and 9 broad; bounded north by the Public Reſervation, and part of the townſhips of Manlius and Camillus. A very ſmall part of the ſouth end of Salt Lake is within the Reſervation. The Salt Spring, and the Salt Lake, with a ſmall portion of ground on each ſide, is reſerved by the State; its greateſt length is 6½ miles, and the greateſt breadth of the Reſervation 3½.—*ib.*

MILK, or MILKYET, property in Bengal.

MILLER, *Fort*, is on the E. ſide of Hudſon's river, 41 miles north of Albany, conſiſting of rapids in the river, and ſeveral mills thereon. It is ſo called from a little mud fort formerly built there againſt the Indians.—*Morse.*

MILLER'S, or *Payquage*, a river of Maſſachuſetts, which runs W. by S. and falls into Connecticut river, between Northfield and Montague. It is a beautiful ſtream, though in ſome places very rapid. Its chief ſource is in Monomenock pond in Rindge, New-Hampſhire, and partly in Winchendon; the other in Naukheag pond in Aſhburnham. Theſe with various ſtreams unite in Winchendon, and form Miller's river.—*ib.*

MILLERS, a ſettlement in Kentucky, on a branch of Licking river, 32 miles north-eaſt of Lexington.—*ib.*

MILLER'S-TOWN, in Northampton county, Pennſylvania, is pleaſantly ſituated on a branch of Little Lehigh river; 26 miles S. W. of Eaſton, and 47 N. W. by N. of Philadelphia. It contains about 40 houſes.—*ib.*

MILLER'S-TOWN, a ſmall town in Shenandoah county, Virginia, 32 miles ſouth of Wincheſter. Two or three miles from this place is the narrow paſs, formed by the Shenandoah river on one ſide, and a ſmall brook on the other. It is about a rod and a half wide, and 2 or 3 long; on each ſide is a bank of about 100 feet high.—*ib.*

MILL *Iſland*, near the N. W. end of Hudſon's

Straits; N. N. W. of Nottingham Iſland, and S. by E. of Cape Comfort, but nearer to the latter. N. lat. 64° 36′. W. long. 80° 30′.—*ib.*

MILL *Iſland*, a ſmall iſland in that branch of Chignecto Bay which runs up due north, whilſt the Bay particularly ſo called, runs in north-eaſt. It is nearly due weſt 4 miles from the neareſt point of land.—*ib.*

MILLS of various kinds are deſcribed in the article Mechanics *(Encycl.)*; and he who ſhall ſtudy that article, together with *Water-Works*, and Machinery, in this *Supplement*, will have a ſufficient knowledge of the principles upon which mills muſt be conſtructed ſo as that they may produce their proper effects. The ſubject is introduced into this place merely to put it into the power of our countrymen to adopt, if they ſhall think fit, the improvements which have been made in the machinery of flour mills in America.

The chief of theſe conſiſt in a new application of the ſcrew, and the introduction of what are called elevators, the idea of which was evidently borrowed from the chain pump. The ſcrew is made by ſticking ſmall thin pieces of board, about three inches long and two wide, into a cylinder, ſo as to form the ſpiral line. This ſcrew is placed in a horizontal poſition, and by turning on its axis it forces wheat or flour from one end of a trough to the other. For inſtance, in the trough which receives the meal immediately coming from the ſtones, a ſcrew of this kind is placed, by which the meal is forced on, to the diſtance of ſix or eight feet, perhaps, into a reſervoir; from thence, without any manual labour, it is conveyed to the very top of the mill by the elevators, which conſiſt of a number of ſmall buckets of the ſize of tea cups, attached to a long band that goes round a wheel at the top, and another at the bottom of the mill. As the band revolves round the wheels, theſe buckets dip into the reſervoir of wheat or flour below, and take their loads up to the top, where they empty themſelves as they turn round the upper wheel. The elevators are incloſed in ſquare wooden tubes, to prevent them from catching in any thing, and alſo to prevent duſt. By means of theſe two ſimple contrivances no manual labour is required from the moment the wheat is taken to the mill till it is converted into flour, and ready to be packed, during the various proceſſes of ſcreening, grinding, ſifting, &c.

That this is a conſiderable improvement is obvious; and we are not without hopes that it may be adopted. The licentiouſneſs of an Engliſh mob has indeed perſecuted an Arkwright, expelled the inventor of the fly-ſhuttle from his native country, and by ſuch conduct prevented the re-erection of the Albion mills, and the general eſtabliſhment of ſaw-mills through the kingdom; but their ſovereignty perhaps will not be rouſed by ſo eaſy and ſimple a contrivance as this to leſſen the quantity of manual labour. For an account of the Dutch oil-mill, which was ſomehow omitted in its proper place in the *Encyclopædia*, ſee *Oil-Mill* in this *Supplement*.

MILLSTONE, a ſouth branch of Rariton river, in New-Jerſey.—*Morſe.*

Millstone, a pleaſant rural village, ſituated on the river of its name, 14 miles N. of Princeton, in New-Jerſey, containing the ſeat of General Frelinghuyſen, and formerly the county town of Somerſet.—*ib.*

MILLTOWN, in the State of Delaware, two miles from Wilmington.—*ib.*

Milltown, in Northumberland county, Pennſylvania, on the E. ſide of the W. branch of Suſquehannah river, containing about 60 houſes, and 14 miles N. by W. of Sunbury.—*ib.*

MILTON, a townſhip in Chittenden county, Vermont, ſituated on the eaſt ſide of Lake Champlain, oppoſite to South Hero Iſland. It is divided into nearly equal parts by La Moille river, which empties into the lake in Colcheſter, near the S. line of Milton. The townſhip contains 282 inhabitants.—*ib.*

Milton, the *Uncataquiſſett*, or Unquety of the ancient Indians, a townſhip in Norfolk county, Maſſachuſetts; adjoining to Dorcheſter, from which it is partly ſeparated by Naponſet river, noted for the excellent quality of its water. It is 7 miles S. of Boſton, and contains 1039 inhabitants; 3 paper-mills, and a chocolate-mill. It was incoporated in 1662. Milton hill affords one of the fineſt proſpects in America.—*ib.*

Milton, a townſhip in the new county of Saratoga in New-York. By the State cenſus of 1796, there were 301 of the inhabitants who were electors.—*ib.*

Milton, a military townſhip in Onondago county, New-York, ſituated on the N. E. ſide of Cayuga Lake, near its ſouthern extremity; 40 miles N. of Tioga river, and 21 S. by E. of the ferry on the N. end of Cayuga Lake. It was incorporated in 1794. By the State cenſus of 1796, 181 of its inhabitants were electors.—*ib.*

Milton, a ſmall town in Albemarle county, Virginia, ſituated on the S. W. ſide of the Rivanna, about 80 miles N. W. by W. of Richmond. It has about 20 houſes and a ware-houſe for the inſpection of tobacco.—*ib*

MINAS, *Baſin of*, or *Les Mines Bay*, ſometimes alſo called *Le Grand Praye*; is a gulf on the S. E. ſide of the Bay of Fundy, into which its waters paſs by a narrow ſtrait, and ſet up into Nova-Scotia in an E. and S. direction. It is about 30 leagues from the entrance of Annapolis, and 10 from the bottom of Bedford Bay. It is 12 leagues in length, and three in breadth.—*ib.*

Minas, or *De las Minas Hill*, is the middlemoſt of the three hills, deſcribed as marks within land for Bonaventura Bay and river, on the coaſt of Peru, in S. America: theſe are S. of Panama Bay, and in N. lat. 3° 20′, W. long. 75° 18′.—*ib.*

MINE AU FER, or *Iron Mines*, on the E. ſide of Miſſiſſippi river, is 67¼ miles N. by E. of Chickaſaw river, and 15 S. by E. of the Ohio. Here the land is nearly ſimilar in quality to that bordering on the Chickaſaw river, interſperſed with gradual riſings or ſmall eminences. There was a poſt at this place, near the former S. boundary of Virginia.—*ib.*

MINEHEAD, a townſhip in Eſſex county, Vermont, on Connecticut river.—*ib.*

MINERALOGY

1 Definition. IS a ſcience, the object of which is the deſcription and arrangement of *inorganic bodies*, or *minerals*; or of *all* the bodies which belong to our globe, excepting *animal* and *vegetable* ſubſtances.

Since the publication of the article MINERALOGY, *Encycl.* ſcarcely a ſingle day has paſſed without the diſcovery of ſome new mineralogical fact, or the detection of ſome old and unſuſpected error. Theſe improvements cannot be overlooked in the preſent *Supplement*. But they are ſo numerous in every part of the ſcience, that we can hardly notice them without giving a pretty complete view of the preſent ſtate of mineralogy. This will ſcarcely occupy more room, and muſt be much more uſeful as well as entertaining, than an undigeſted maſs of annotations and remarks. We undertake this taſk the more readily, because in the article MINERALOGY in the *Encyclopædia*, the improvements of Mr Werner and his diſciples, to which the ſcience is indebted for a great part of its preſent accuracy, have been entirely overlooked.

2 Object. The object of mineralogy is twofold. 1. To *deſcribe* every mineral with ſo much accuracy and preciſion, that it may be eaſily diſtinguiſhed from every other mineral; 2. To *arrange* them into a ſyſtem in ſuch a manner that every mineral may be eaſily referred to its proper place, and that a perſon may be able, merely by the help of the ſyſtem, to diſcover the *name* of any mineral whatever. When theſe two objects are accompliſhed, mi- Deſcription of Minerals. neralogy, ſtrictly ſo called, is completed. But were we to ſtop here, the utility of the ſcience, if it would be entitled to the name of ſcience, could hardly be conſidered as very great. We muſt therefore apply *chemiſtry* to diſcover the ingredients of which minerals are compoſed, and to detect, if poſſible, the laws which theſe ingredients have obſerved in their combination. Thus we ſhall really extend our knowledge of inorganic nature, and be enabled to apply that knowledge to the improvement of almoſt every art and manufacture.

3 Diviſion of the article. Mineralogy naturally divides itſelf into three parts. The *firſt* treats of the method of deſcribing minerals; the *ſecond*, of the method of arranging them; and the *third* exhibits them in a ſyſtem deſcribed and arranged according to the rules laid down in the two firſt parts. Theſe three parts ſhall be the ſubjects of the following chapters; and we ſhall finiſh the article with a chapter on the chemical analyſis of minerals.

CHAP. I. OF THE DESCRIPTION OF MINERALS.

NOTHING, at firſt ſight, appears eaſier than to deſcribe a mineral, and yet, in reality, it is attended with a great deal of difficulty. The mineralogical deſcriptions of the ancients are ſo looſe and inaccurate, that many of the minerals to which they allude cannot be aſcertained; and conſequently their obſervations, however valuable in themſelves, are often, as far as reſpects us, altogether loſt. It is obvious, that to diſtinguiſh a mineral from every other, we muſt either mention ſome peculiar property, or a collection of properties, which exiſt together in no other mineral. Theſe properties muſt be deſcribed in terms rigidly accurate, which convey preciſe ideas of the very properties intended, and of no other properties. The ſmalleſt deviation from this would lead to confuſion and uncertainty. Now it is impoſſible to deſcribe minerals in this manner, unleſs there be a peculiar term for each of their properties; and unleſs this term be completely underſtood. Mineralogy therefore muſt have a language of its own; that is to ſay, it muſt have a *term* to denote every mineralogical property, and each of theſe terms muſt be accurately defined. The language of mineralogy was invented by the celebrated Werner of Freyberg, and firſt made known to the world by the publication of his treatiſe on *the external characters of minerals*. Of this language we ſhall give a view in the following general deſcription of the properties of minerals (A).

4 Properties of minerals. The properties of minerals may be divided into two claſſes. *1ſt*, Properties diſcoverable without deſtroying the texture of the mineral; *2d*, Properties reſulting from the action of other bodies on it. The firſt claſs has, by Werner and his diſciples, been called *external* properties, and by ſome French writers *phyſical*; the ſecond claſs has been called *chemical*.

External Characters. The *external* properties may be arranged under the following heads:

1 Figure.
2 Surface.
3 Tranſparency.
4 Colour.
5 Scratch.
6 Luſtre.
7 Hardneſs.
8 Ductility.
9 Fracture.
10 Texture.
11 Structure.
12 Fragments.
13 Feel.
14 Sound.
15 Smell.
16 Taſte.
17 Gravity.
18 Magnetiſm.
19 Electricity.

5 Figure. I. By FIGURE is meant the ſhape or form which a mineral is obſerved to have. The *figure* of minerals is either *regular*, *particular*, or *amorphous*. 1. Minerals which aſſume a regular figure are ſaid to be cryſtallized.* The *ſides* of a cryſtal are called *faces*; the ſharp line formed by the inclination of two faces is called an *edge*; and the corner, or angle, formed by the meeting of ſeveral edges in one point, is called a *ſolid angle*, or ſimply *an angle*. Thus a cube has ſix faces, twelve edges, and eight angles. 2. Some minerals, though not cryſtallized, affect *a particular* figure. Theſe particular figures are the following: *Globular*, like a globe; *oval*, like an oblong ſpheriod; *ovate*, like an egg; *cheeſe-ſhaped*, a very flattened ſphere; *almond-ſhaped*, like an almond; *lenticular*, like a double convex lenſe, compreſſed and gradually thinner towards the edges; *cuneiform* like a wedge; *nodulous*, having depreſſions and protuberances like a potatoe; *botryoidal*, like grapes cloſely preſſed together; *dentiform*, longiſh and tortuous, and thicker at the bottom than the top; *wireform*, like a wire; *capillary*, like hair, finer than the preceding; *retiform*, threads interwoven like a net; *dendritic*, like a tree, having branches iſſuing from a common ſtem; *ſhrubform*, branches not ariſing from a common ſtem; *coralloidal*, branched like coral; *ſtalactitical*, like iſicles; *clavated*, like a club, long, and thicker at one end than another; *faſciform*, long ſtraight cylindrical

* See CHEMISTRY, Part III. ch. iv. *Suppl.*

(A) The fulleſt account of Werner's external characters which we have ſeen in the Engliſh language, has been given by Dr Townſon in his *Philoſophy of Mineralogy*. We have availed ourſelves of this book, in order to [illegible] ſome of the lateſt improvements of Werner and his diſciples. The reader may alſo conſult *Werner's Treatiſe*, publiſhed at Leipſic in 1774; or the *French tranſlation* publiſhed at Dijon in 1790. See alſo *Romé de Liſle. Des caracteres exterieur des mineraux.* And *Hauy Jour. d'hiſt. Nat.* II. 56.

drical bodies, united like a bundle of rods; *tubular*, cylindrical and hollow. 3. When minerals have neither a regular nor particular ſhape, they are ſaid to be *amorphous*.

6 Surface. II. By SURFACE is meant the appearance of the external ſurface of minerals. The *ſurface* is either *uneven*, compoſed of ſmall unequal elevations and depreſſions; *ſcabrous*, having very ſmall *ſharp* and rough elevations, more eaſily felt than ſeen; *druſy*, covered with very minute cryſtals; *rough*, compoſed of very minute *blunt* elevations, eaſily diſtinguiſhable by the feel; *ſcaly*, compoſed of very minute thin ſcale-like leaves; *ſmooth*, free from all inequality or roughneſs; *ſpecular*, having a ſmooth poliſhed ſurface like a mirror: or *ſtreaked*, having elevated, ſtraight, and parallel lines. This laſt character is confined to the *ſurface* of cryſtals. The *ſtreaks* are either *tranſverſe*; *longitudinal*; *alternate*, in different directions on different faces; *plumoſe*, running from a middle rib; or *decuſſated*, croſſing each other.

7 Tranſparency. III. By TRANSPARENCY is meant the proportion of light which minerals are capable of tranſmitting. They are *tranſparent* or *pellucid*, when objects can be ſeen diſtinctly through them; *diaphanous*, when objects are ſeen through them indiſtinctly; *ſubdiaphanous*, when light paſſes but in ſo ſmall a quantity that objects cannot be ſeen through them (B); *opaque*, when no light is tranſmitted.

When opaque minerals become tranſparent in water, they are called *hydrophanous*. When objects are ſeen double through a tranſparent mineral, it is ſaid to *refract doubly*.

8 Colour. IV. The colours of minerals may be reduced to eight claſſes.

1. *Whites.*

Snow white. Pure white.

Reddiſh white. White with a light tint of red.

Yellowiſh white. White with a light tint of yellow.

Silver white. Yellowiſh white with a metallic luſtre.

Greyiſh white. White with a light tint of black.

Greeniſh white. White with a light tint of green.

Milk white. White with a light tint of blue.

Tin white. Milk white of a metallic luſtre.

2. *Greys.*

Bluiſh grey. Grey with a little blue.

Lead Grey. Bluiſh grey with a metallic luſtre.

Pearl grey. Light grey with a ſlight mixture of violet blue.

Smoke grey. Dark grey with a little blue and brown.

Greeniſh grey. Light grey tinged with green.

Yellowiſh grey. A light grey tinged with yellow.

Steel grey. A dark grey with a light tint of yellow and a metallic luſtre.

Black grey. The darkeſt grey with a tint of yellow.

3. *Blacks.*

Greyiſh black. Black with a little white.

Browniſh black. Black with a tint of brown.

Black. Pure Black.

Iron black. Pure black with a ſmall mixture of white and a metallic luſtre.

Bluiſh black. Black with a tint of blue.

4. *Blues.*

Indigo blue. A dark blackiſh blue.

Pruſſian blue. The pureſt blue.

Azure blue. A bright blue with ſcarce a tint of red.

Smalt blue. A light blue.

Violet blue. A mixture of azure blue and carmine.

Lavender blue. Violet blue mixed with grey.

Sky blue. A light blue with a ſlight tint of green.

5. *Greens.*

Verdigris green. A bright green of a bluiſh caſt.

Seagreen. A very light green, a mixture of verdigris green and grey.

Beryl Green. The preceding, but of a yellowiſh caſt.

Emerald green. Pure green.

Graſs green. Pure green with a tint of yellow.

Apple green. A light green formed of verdigris green and white.

Leek green. A very dark green with a caſt of brown.

Blackiſh green. The darkeſt green, a mixture of leek green and black.

Piſtachio green. Graſs green, yellow and a little brown.

Olive green. A pale yellowiſh green with a tint of brown.

Aſparagus green. The lighteſt green, yellowiſh with a little brown and grey.

6. *Yellows.*

Sulphur yellow. A light greeniſh yellow.

Braſs yellow. The preceding, with a little leſs green and a metallic luſtre.

Lemon yellow. Pure yellow.

Gold yellow. The preceding with a metallic luſtre.

Honey yellow. A deep yellow with a little reddiſh brown.

Wax yellow. The preceding, but deeper.

Pyritaceous. A pale yellow with grey.

Straw yellow. A pale yellow, a mixture of ſulphur yellow and reddiſh grey.

Wine yellow. A pale yellow with a tint of red.

Ochre yellow. Darker than the preceding, a mixture of lemon yellow with a little brown.

Iſabella yellow. A pale browniſh yellow, a mixture of pale orange with reddiſh brown.

Orange yellow. A bright reddiſh yellow, formed of lemon yellow and red.

7. *Reds.*

Aurora red. A bright yellow red, a mixture of ſcarlet and lemon yellow.

Hyacinth red. A high red like the preceding, but with a ſhade of brown.

Brick red. Lighter than the preceding; a mixture of aurora red and a little brown.

Scarlet red. A bright and high red with ſcarce a tint of yellow.

Copper red. A light yellowiſh red with the metallic luſtre.

Blood red. A deep red, a mixture of crimſon and ſcarlet.

Carmine red. Pure red verging towards a caſt of blue.

Cochineal red. A deep red; a mixture of carmine with a little blue and a very little grey.

Crimſon red. A deep red with a tint of blue.

Fleſh red. A very pale red of the crimſon kind.

Roſe red. A pale red of the cochineal kind.

(B) After Mr Kirwan, we have denoted theſe three degrees of tranſparency by the figures 4, 3, 2. When a mineral is ſubdiaphanous only at the edges, that is denoted by the figure 1. Opacity is ſometimes denoted by 0.

Peach bloſſom red. A very pale whitiſh red of the crimſon kind.

Morderé. A dark dirty crimſon red; a mixture of crimſon and a little brown.

Browniſh red. A mixture of blood red and brown.

8. *Browns.*

Reddiſh brown. A deep brown inclining to red.

Clove brown. A deep brown with a tint of carmine.

Yellowiſh brown. A light brown verging towards ochre yellow.

Umber brown. A light brown, a mixture of yellowiſh brown and grey.

Hair brown. Intermediate between yellow brown and clove brown with a tint of grey.

Tombac brown. A light yellowiſh brown, of a metallic luſtre, formed of gold yellow and reddiſh brown.

Liver brown. A dark brown; blackiſh brown with a tint of green.

Blackiſh brown. The darkeſt brown.

Colours, in reſpect of intenſity, are either *dark*, *deep*, *light*, or *pale*. When a colour cannot be referred to any of the preceding, but is a mixture of two, this is expreſſed, by ſaying, that the prevailing one *verges* towards the other, if it has only a ſmall tint of it; *paſſes* into it, if it has a greater.

9 Streak. V. By the SCRATCH or STREAK, is meant the mark left when a mineral is ſcratched by any hard body, as the point of a knife. It is either *ſimilar*, of the ſame colour with the mineral; or *diſſimilar*, of a different colour.

10 Luſtre. VI. LUSTRE, is the gloſs or brightneſs which appears on the external ſurface of a mineral, or on its internal ſurface when freſh broken. The firſt is called *external*, the ſecond *internal* luſtre. Luſtre is either *common*, that which moſt minerals poſſeſs; *ſilky*, like that of ſilk or mother-of-pearl; *waxy*, like that of wax; *greaſy*, like that of greaſe; or *metallic*, like that of metals.

As to the degree, the greateſt is called *ſplendent*, the next *ſhining*, the third *dulliſh*; and when only a few ſcattered particles ſhine, the luſtre is called *dull* (c).

11 Hardneſs. VII. We have uſed figures to denote the comparative HARDNESS of bodies; for an explanation of which, we refer to the article CHEMISTRY, Vol. I. p. 272, of this *Supplement.*

12 Ductility and brittleneſs. VIII. With reſpect to DUCTILITY and BRITTLENESS, minerals are either *malleable*; *ſectile*, capable of being cut without breaking, but not malleable; *flexile*, capable of being bent, and when bent retaining their ſhape; or *elaſtic*, capable of being bent, but recovering their former ſhape. Minerals deſtitute of theſe properties are *brittle*. Brittle minerals, with reſpect to the eaſe with which they may be broken, are either *very tough*, *tough*, *fragile*, or *very fragile.*

13 Fracture. IX. By FRACTURE is meant the freſh ſurface which a mineral diſplays when broken. It is either *flat*, without any general elevation or depreſſion; or *conchoidal*, having wide extended roundiſh hollows and gentle riſings. When theſe are not *very* evident, the fracture is called *flat* conchoidal; when they are ſmall, it is called *ſmall* conchoidal; and when of great extent, *great* conchoidal.

The fracture may alſo be *even*, free from all aſperities; *uneven*, having many ſmall, ſharp, abrupt, irregular elevations and inequalities; and from the ſize of theſe, this fracture is denominated *coarſe*, *ſmall*, or *fine*; *ſplintery*, having ſmall, thin, half detached, ſharp edged ſplinters, according to the ſize of which this fracture is denominated *coarſe* or *fine*; or *rugged*, having many very minute ſharp hooks, more ſenſible to the hand than the eye.

14 Texture. X. By TEXTURE is meant the internal ſtructure or diſpoſition of the matter of which a mineral is compoſed, which may be diſcovered by breaking it. The texture is either *compact*, without any diſtinguiſhable parts, or the appearance of being compoſed of ſmaller parts; *earthy*, compoſed of very minute *almoſt* imperceptible rough parts; *granular*, compoſed of ſmall ſhapeleſs grains; *globuliform*, compoſed of ſmall ſpherical bodies; *fibrous*, compoſed of fibres which may be *long*, *ſhort*, *ſtraight*, *crooked*, *parallel*, *divergent*, *ſtellated*, *faſciculated*, or *decuſſated*; *radiated*, conſiſting of long narrow flattiſh lamellæ; or *lamellar* or *foliated*, conſiſting of ſmooth continued plates covering each other: theſe plates may be either *ſtraight*, *crooked*, or *undulating*.

15 Structure. XI. The STRUCTURE or COMPOUND TEXTURE is the manner in which the parts that form the texture are diſpoſed. It is either *ſlaty*, in ſtraight layers like ſlate; *teſtaceous*, in incurvated layers; *concentric*, in concentric layers; or *columnar*, in columns.

The *texture* and *ſtructure* may at firſt view appear the ſame; but in reality they are very different. Thus common ſlate has often the *ſlaty ſtructure* and *earthy texture*. The texture of pitcoal is compact, but its ſtructure is often ſlaty.

16 Fragments. XII. By FRAGMENTS is meant the ſhape of the pieces into which a mineral breaks when ſtruck with a hammer. They are either *cubic*; *rhomboidal*; *wedgeſhaped*; *ſplintery*, thin, long, and pointed; *tabular*, thin, and broad, and ſharp at the corners, as common ſlate; or *indeterminate*, without any particular reſemblance to any other body. The *edges* of indeterminate fragments are either *very ſharp*, *ſharp*, *ſharpiſh*, or *blunt*.

17 Feel. XIII. By the FEEL of minerals is meant the ſenſation which their ſurfaces communicate when handled. The feel of ſome minerals is *greaſy*, of others *dry*, &c.

18 Sound. XIV. Some minerals when ſtruck give a *clear* SOUND, as common ſlate; others a *dull* ſound.

The SMELL, TASTE, SPECIFIC GRAVITY, and MAGNETISM of minerals, require no explanation.

With reſpect to ELECTRICITY, ſome minerals become electric when *heated*, others when *rubbed*, others cannot be rendered electric. The electricity of ſome minerals is *poſitive* or *vitreous*, of others *negative* or *reſinous*.

As for the CHEMICAL properties of minerals, they have been already explained in the article CHEMISTRY, which makes a part of this *Supplement*. And for the deſcription of the blow-pipe, and the manner of uſing it, we refer the reader to a treatiſe on that ſubject prefixed to the article MINERALOGY in the *Encyclopædia*.

CHAP. II. OF THE ARRANGEMENT OF MINERALS.

MINERALS may be arranged two ways, according to their external characters, and according to their chemical compoſition. The firſt of theſe methods has been called an *artificial* claſſification; the ſecond, a *natural* one. The firſt is indiſpenſably neceſſary for the ſtudent of nature; the ſecond is no leſs indiſpenſable for the proficient who means to turn his knowledge to account. Without the firſt, it is impoſſible to diſcover the *names* of minerals; and without the ſecond, we muſt remain ignorant of their uſe.

(c) Theſe four degrees have been denoted by Kirwan by the figures 4, 3, 2, 1, and no luſtre by 0. We have imitated him in the preſent article.

Almoſt every ſyſtem of mineralogy hitherto publiſhed, at leaſt ſince the appearance of Werner's *external characters*, has attempted to combine theſe two arrangements, and to obtain at one and the ſame time the advantages peculiar to each. But no attempt of this kind has hitherto ſucceeded. Whether this be owing to any thing impoſſible in the undertaking, or to the preſent imperfect ſtate of mineralogy, as is more probable, we do not take upon us to determine. But ſurely the want of ſucceſs, which has hitherto attended all attempts to combine the two arrangements, ought to ſuggeſt the propriety of ſeparating them. By adhering ſtrictly to one language, the trouble of ſtudying two different ſyſtems would be entirely prevented. They would throw mutual light upon each other: the artificial ſyſtem would enable the ſtudent to diſcover the *names* of minerals; the natural would enable him to arrange them, and to ſtudy their properties and uſes.

The happy arrangement of Cronſtedt, together with the ſubſequent improvements of Bergman, Werner, Kirwan, Hauy, and other celebrated mineralogiſts, has brought the *natural* ſyſtem of mineralogy to a conſiderable degree of perfection. But an *artificial* ſyſtem is ſtill a deſideratum; for excepting Linnæus, whoſe ſucceſs was precluded by the ſtate of the ſcience, no one has hitherto attempted it. Though we are very far from thinking ourſelves ſufficiently qualified for undertaking ſuch a taſk, we ſhall nevertheleſs venture, in the next chapter, to ſketch out the rudiments of an artificial ſyſtem. The attempt, at leaſt, will be laudable, even though we ſhould fail.

CHAP. III. ARTIFICIAL SYSTEM.

19
Artificial claſſes.

MINERALS may be divided into ſix claſſes:

1. Minerals that cannot be fuſed by the blow-pipe *per ſe*.
2. Minerals fuſible *per ſe* by the blow-pipe.
3. Minerals fuſible by the blow-pipe *per ſe* when expoſed to the blue flame, but not when expoſed to the yellow flame.
4. Minerals fuſible *per ſe* by the blow-pipe; and when in fuſion, partly evaporating in a viſible ſmoke.
5. Minerals which totally evaporate before the blowpipe.
6. Minerals totally ſoluble in muriatic acid with effervеſcence, the ſolution colourleſs.

Under theſe heads we ſhall arrange the ſubjects of the mineral kingdom.

CLASS I. INFUSIBLE.

ORDER I. Specific gravity from 16 to 12.
Genus I. Colour whitiſh iron grey.
Species 1. Native platinum.

ORDER II. Sp. gr. 8.5844 to 7.006.
Genus I. Attracted by the magnet.
Sp. 1. Native iron.
Genus II. Not attracted by the magnet.
Sp. 1. Native copper.
Flexible and malleable. Colour uſually red.
Sp. 2. Wolfram.
Brittle. Colour uſually brown or black.

ORDER III. Sp. gr. from 6.4509 to 5.8.
Genus I. Forms a blue glaſs with microcoſmic ſalt, which becomes colourleſs in the yellow, but recovers its colour in the blue flame.
Sp. 1. Tungſtat of lime.
Genus II. Forms with microcoſmic ſalt a permanently coloured bead.
Sp. 1. Sulphuret of cobalt.

ORDER IV. Sp. gr. from 4.8 to 4.5.
Genus I. Tinges borax dark green.
Sp. 1. Common magnetic iron ſtone.
Genus II. Tinges borax reddiſh brown.
Sp. 1. Grey ore of mangancſe.

ORDER V. Sp. gr. from 4.4165 to 3.092. Infuſible with fixed alkalies.
Genus I. Hardneſs 20.
Sp. 1. Diamond.
Genus II. Hardneſs 15 to 17. Cauſes ſingle refraction.
Sp. 1. Teleſia.
Sp. 2. Corundum.
Genus III. Hardneſs 13. Single refraction.
Sp. 1. Ruby.
Cryſtallizes in octohedrons.
Genus IV. Hardneſs 12. Single refraction.
Sp. 1. Chryſoberyl.
Genus V. Hardneſs 12. Cauſes double refraction. Becomes electric when heated.
Sp. 1. Topaz.
Genus VI. Hardneſs 10 to 16. Double refraction. Sp. gr. 4.2 to 4.165.
Sp. 1. Zircon.
Genus VII. Hardneſs 6 to 9. Feels greaſy.
Sp. 1. Cyanite.
Genus VIII. Hardneſs 9 to 10. Feel not greaſy. Double refraction. Sp. gr. 3.283 to 3.285.
Sp. 1. Chryſolite.
Genus IX. Hardneſs 12. Infuſible with borax. Colour of large maſſes black, of thin pieces deep green.
Sp. Ceylanite.
(Phoſphat of lime.)

ORDER VI. Sp. gr. from 2.9829 to 1.987. Infuſible with fixed alkalies.
Genus I. Hardneſs 12.
Sp. 1. Emerald.
Genus II. Hardneſs 10.
Sp. 1. Jade.
Genus III. Hardneſs 6 to 7. Somewhat tranſparent.
Sp. 1. Phoſphat of lime.
Before the blow-pipe becomes ſurrounded with a luminous green vapour.
Genus IV. Hardneſs 6. Opaque.
Sp. 1. Micarelle.
Genus V. Stains the fingers. Colour lead grey.
Sp. 1. Plumbago.
Spaniſh wax rubbed with plumbago does not become electric; or if it does, the electricity is negative. Streak lead grey even on earthen ware.

ORDER VII. Sp. gr. from 4.7385 to 4.569. Fuſible with fixed alkalies.

Genus I. Stains the fingers. Colour lead grey.

Sp. 1. Molybdena.

Spaniſh wax rubbed with molybdena becomes poſitively electric. Streak on earthen ware yellowiſh green.

ORDER VIII. Sp. gr. from 4.1668 to 2.479. Fuſible with fixed alkalies.

* Hardneſs from 10 to 12.

Genus I. Uſually white. Cryſtals dodecahedrons. Double refraction. Fracture imperfectly conchoidal or ſplintery. Brittle.

Sp. 1. Quartz.

Genus II. Uſually dark brown. Fracture perfectly conchoidal. Brittle. Eaſily breaks into ſplinters.

Sp. 1. Flint.

Genus III. Not brittle. Fracture even or imperfectly conchoidal.

Sp. 1. Chalcedony.

Sp. 2. Jaſper.

Genus IV. Forms with potaſs a violet glaſs, with ſoda or borax a brown glaſs, with microcoſmic ſalt a honey yellow glaſs. Colour green. Amorphous.

Sp. 1. Chryſopraſium.

Genus V. Tinges ſoda red. The colour diſappears before the blue flame, and returns before the yellow flame.

Sp. 1. Oxyd of manganeſe and barytes.

Sp. 2. Black ore of manganeſe.

Sp. 3. Carbonat of manganeſe.

(Brown ore of iron. Red ore of iron.)

** Hardneſs 9 to 3.

Genus VI. Flexible and elaſtic in every direction.

Sp. 1. Elaſtic quartz.

Genus VII. Emits white flakes before the blow-pipe.

Sp. 1. Blende.

Genus VIII. Becomes electric when heated.

Sp. 1. Calamine.

Genus IX. Tinges borax green. Blackens before the blow-pipe.

Sp. 1. Mountain blue.

Colour blue.

Sp. 2. Green carbonat of copper.

Colour green.

Genus X. Tinges borax green. Becomes attractable by the magnet by the action of the blow-pipe.

Sp. 1. Brown iron ore.

Colour brown.

Sp. 2. Red iron ore.

Colour red.

Genus XI. Tinges borax ſmutty yellow. Becomes browniſh black before the blow-pipe.

Sp. 1. Carbonat of iron.

Genus XII. Feels greaſy.

Sp. 1. Steatites.

(Black ore of Manganeſe. Carbonat of manganeſe. Mica.)

ORDER IX. Sp. gr. from 2.39 to 1.7.

Genus I. Luſtre glaſſy.

Sp. 1. Opal.

Sp. 2. Hyalite.

Genus II. Luſtre greaſy.

Sp. 1. Pitchſtone.

Genus III. Luſtre waxy or pearly.

Sp. 1. Staurolite.

Class II. FUSIBLE.

ORDER I. Sp. gr. from 19 to 10.

Genus I. Colour Yellow.

Sp. 1. Native gold.

Genus II. Colour white.

Sp. 1. Native Silver.

Genus III. Colour yellowiſh white.

Sp. 1. Alloy of ſilver and gold.

ORDER II. Sp. gr. from 7.786 to 4.5.

Genus I. Flexible and malleable.

Sp. 1. Sulphuret of ſilver.

** Brittle.

Genus II. Tinges borax white.

Sp. 1. Tinſtone.

Genus III. Tinges borax green.

Sp. 1. Sulphuret of copper.

Colour bluiſh grey.

Sp. 2. Chromat of lead.

Colour aurora red.

Sp. 3. Purple copper ore.

Colour purple.

Genus IV. Tinges borax faint yellow. Becomes black when expoſed to the vapour of ſulphuret of ammonia.

Sp. 1. Galena.

Colour bluiſh grey. Luſtre metallic. Fragments cubic.

Sp. 2. Black lead ore.

Colour black. Luſtre metallic.

Sp. 3. Lead ochre.

Colour yellow, grey, or red. Luſtre o.

Sp. 4. Carbonat of lead.

Colour white. Luſtre waxy.

Sp. 5. Phoſphat of lead.

Uſually green. Luſtre waxy. After fuſion by the blow-pipe cryſtallizes on cooling.

Sp. 6. Molybdat of lead.

Colour yellow. Streak white. Luſtre waxy.

ORDER III. Sp. gr. from 4.35 to 3.

* Hardneſs 14 to 9.

Genus I. Melts without frothing into a grey enamel.

Sp. 1. Garnet.

Colour red.

Genus II. Melts into a browniſh enamel.

Sp. 1. Shorl.

Colour black. Opaque.

Genus III. Froths and melts into a white enamel.

Sp. 1. Tourmaline.

Becomes electric by heat.

Genus IV. Froths and melts into a greeniſh black enamel.

Sp. 1. Baſaltine.

Genus V. Froths and melts into a black enamel.

Sp. 1. Thallite.

Colour dark green.

Sp. 2. Thumerſtone.

Colour clove brown.

** Hardneſs 5 to 8.

Genus VI. Melts into a tranſparent glaſs.

Artificial Syſtem.

Sp. 1. Fluat of lime.

Powder phoſphoreſces when thrown on a hot iron.

Genus VII. Melts into a black glaſs.

Sp. 1. Hornblende.

Genus VIII. Melts into a black bead with a ſulphureous ſmell, and depoſits a blue oxyd on the charcoal.

Sp. 1. Sulphuret of tin.

Genus IX. Melts into a brown glaſs. Tinges borax violet.

Sp. 1. Aſbeſtoid.

Colour green.

Genus X. Melts into a brown (?) glaſs. When fuſed with potaſs, and diſſolved in water, the ſolution becomes of a fine orange yellow.

Sp. 1. Chromat of iron.

Genus XI. Before the blow-pipe yields a bead of copper.

Sp. 1. Red oxyd of copper.

(Sulphuret of copper.)

ORDER IV. Sp. gr. from 2.945 to 2.437.

Genus I. Compoſed of ſcales.

Sp. 1. Talk.

Feels greaſy. Spaniſh wax rubbed by it becomes poſitively electric.

Genus II. Compoſed of thin plates, eaſily ſeparable from each other.

Sp. 1. Mica.

Plates flexible and elaſtic, may be torn but not broken. Spaniſh wax rubbed by it becomes negatively electric.

Sp. 2. Stilbite.

Plates ſomewhat flexible. Colour pearl white. Powder renders ſyrup of violets green. Froths and melts into an opaque white enamel.

Sp. 3. Lepidolite.

Colour violet. Powder white with a tint of red. Froths and melts into a white ſemitranſparent enamel full of bubbles.

Genus III. Texture foliated.

Sp. 1. Felſpar.

Fragments rhomboidal. Hardneſs 9 to 10.

Sp. 2. Leucite.

Always cryſtallized. White. Powder renders ſyrup of violets green. Hardneſs 8 to 10.

Sp. 3. Argentine felſpar.

Always cryſtallized. Two faces dead white, two ſilvery white.

Sp. 4. Prehnite.

Colour green. Froths and melts into a brown enamel.

Genus IV. Texture fibrous. Fibres eaſily ſeparated.

Sp. 1. Aſbeſtus.

Feels ſomewhat greaſy.

Genus V. Texture ſtriated.

Sp. 1. Ædelite.

Abſorbs water. Froths and melts into a frothy maſs.

Genus VI. Texture earthy or compact.

Sp. 1. Lazulite.

Froths and melts into a yellowiſh black maſs. If previouſly calcined, gelatinizes with acids.

Sp. 2. Borat of lime.

Tinges the flame greeniſh, froths and melts into a yellowiſh enamel garniſhed with ſmall projecting points. If the blaſt be continued, theſe dart off in ſparks.

ORDER V. Sp. gr. from 2.348 to 0.68.

Genus I. Hardneſs 10.

Sp. 1. Obſidian.

Colour blackiſh, in thin pieces green.

Genus II. Hardneſs 6 to 8.

Sp. 1. Zeolite.

Gelatinizes with acids. Becomes electric by heat.

Genus III. Hardneſs 3 to 4.

Sp. 1. Amianthus.

Feels greaſy. Texture fibrous.

Sp. 2. Mountain Cork.

Elaſtic like cork.

CLASS III. FUSIBLE BY THE BLUE FLAME, INFUSIBLE BY THE YELLOW.

Genus I. Sp. gr. from 4.43 to 4.4.

Sp. 1. Sulphat of barytes.

Genus II. Sp. gr. from 3.96 to 3.51.

Sp. 1. Sulphat of ſtrontites.

Genus III. Sp. gr. from 2.311 to 2.167.

Sp. 1. Sulphat of lime.

CLASS IV. FUSIBLE, AND PARTLY EVAPORATING.

ORDER I. Sp. gr. from 10 to 5.

Genus I. Colour white or grey. Luſtre metallic.

* Sp. gr. 9 to 10.

Sp. 1. Native amalgam.

Tinges gold white. Creaks when cut.

Sp. 2. Alloy of ſilver and antimony.

Powder greyiſh black.

* * Sp. gr. from 6.467 to 5.309.

Sp. 3. Sulphuret of biſmuth.

Melts when held to the flame of a candle.

Sp. 4. Dull grey cobalt ore.

Streak bluiſh grey. Hardneſs 10. When ſtruck, emits an arſenical ſmell. Luſtre ſcarcely metallic.

Genus II. Colour red, at leaſt of the ſtreak.

Sp. 1. Red ſilver ore.

Burns with a blue flame.

Sp. 2. Hepatic mercurial ore.

Does not flame, but gives out mercury before the blow-pipe.

Genus III. Colour blue.

Sp. 1. Blue lead ore.

Burns with a blue flame and ſulphureous ſmell, and leaves a button of lead.

Genus IV. Colour yellowiſh green.

Sp. 1. Phoſphat and arſeniat of lead combined.

When fuſed by the blow pipe, cryſtallizes on cooling.

Genus V. Colour uſually that of copper. Sp.

gr. 6.6084 to 6.6481.

Sp. 1. Sulphuret of nickel.

Exhales before the blow-pipe an arſenical ſmoke.

ORDER II. Sp. gr. from 4.6 to 3.44.

GENUS I. Colour grey.

Sp. 1. Grey ore of antimony.

Burns with a blue flame, and leaves a white oxyd.

Sp. 2. Grey copper ore.

Crackles before the blow-pipe.

GENUS II. Colour yellow.

Sp. 1. Pyrites.

Burns with a blue flame and ſulphureous ſmell, and leaves a browniſh bead.

Sp. 2. Yellow copper ore.

Melts into a black maſs.

CLASS V. EVAPORATING.

ORDER I. Sp. gr. 13.6.

GENUS I. Fluid.

Sp. 1. Native mercury.

ORDER II. Sp. gr. from 10 to 5.419.

GENUS I. Colour red.

Sp. 1. Native cinnabar.

GENUS II. Colour white or grey. Luſtre metallic.

Sp. 1. Native biſmuth.

Melts into a white bead, and then evaporates in a yellowiſh white ſmoke. Sp. gr. 9 to 9.5.

Sp. 2. Native antimony.

Melts and evaporates in a grey ſmoke. Sp. gr. 6.6 to 6.8.

Sp. 3. Native arſenic.

Evaporates without melting, and gives out a garlic ſmell.

ORDER III. Sp. gr. from 4.8 to 3.33.

GENUS I. Colour red.

Sp. 1. Red antimonial ore.

Melts with a ſulphureous ſmell. Sp. gr. 4.7.

Sp. 2. Realgar.

Melts with a garlic ſmell. Sp. gr. 3.384.

GENUS II. Colour yellow.

Sp. 1. Orpiment.

CLASS VI. SOLUBLE WITH EFFERVESCENCE IN MURIATIC ACID.

GENUS I. Sp. gr. from 4.338 to 4.3.

Sp. 1. Carbonat of barytes.

GENUS II. Sp. gr. from 3.66 to 3.4.

Sp. 1. Carbonat of ſtrontites.

GENUS III. Sp. gr. from 2.8 to 1 or under.

Sp. 1. Carbonat of lime.

We have purpoſely avoided giving names to the claſſes, orders, and genera; becauſe a more careful examination will doubtleſs ſuggeſt many improvements in the arrangement, and an artificial ſyſtem ought to be brought to a great degree of perfection before its claſſes, orders, and genera, be finally ſettled.

We have excluded from this arrangement all thoſe bodies which in the following ſyſtem are arranged under the claſs of combuſtibles; becauſe there can ſcarcely be any difficulty in diſtinguiſhing them both from the other claſſes and from one another. For ſimilar reaſons we have excluded the claſs of ſalts.

CHAP. IV. NATURAL SYSTEM.

Avicenna, a writer of the 11th century, divided minerals into four claſſes; ſtones, ſalts, inflammable bodies, and metals (D). This diviſion has been, in ſome meaſure, followed by all ſucceeding writers. Linnæus, indeed, the firſt of the moderns who publiſhed a ſyſtem of mineralogy, being guided by the external characters alone, divided minerals into three claſſes, *petræ, mineræ, foſſilia:* but Avicenna's claſſes appear among his orders. The ſame remark may be made with reſpect to the ſyſtems of Wallerius, Wolſterdorf, Cartheuſer, and Juſti, which appeared in ſucceſſion after the firſt publication of Linnæus's *Syſtema Naturæ*, in 1736. At laſt, in 1758, the ſyſtem of Cronſtedt appeared. He reinſtated the claſſes of Avicenna in their place; and his ſyſtem was adopted by Bergman, Kirwan, Werner, and the moſt celebrated mineralogiſts who have written ſince. We alſo ſhall adopt his claſſes, with a few ſlight exceptions; becauſe we are not acquainted with any other diviſion which is intitled to a preference.

We ſhall therefore divide this treatiſe into four claſſes. I. Stones. II. Salts. III. Combuſtibles. IV. Ores. 20 Natural claſſes.

The firſt claſs comprehends all the minerals which are compoſed chiefly or entirely of earths; the ſecond, all the combinations of acids and alkalies which occur in the mineral kingdom: the third, thoſe minerals which are capable of combuſtion, and which conſiſt chiefly of ſulphur, carbon, and oil; the fourth, the mineral bodies which are compoſed chiefly of metals.

CLASS I. EARTHS AND STONES.

WE ſhall divide this claſs into three orders. The firſt order ſhall comprehend all chemical combinations of earths with each other; the ſecond order, chemical combinations of earths with acids; and the third order, mechanical mixtures of earths or ſtones. All the minerals belonging to the firſt order exhibit the ſame homogeneous appearance to the eye as if they were ſimple bodies. We ſhall therefore, for want of a better name, call the firſt order *ſimple;* the ſecond order we ſhall diſtinguiſh by the epithet of *ſaline;* and the third we ſhall

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(D) Corpora mineralia in quatuor ſpecies dividuntur, ſcilicet in lapides, et in liquefactiva, ſulphurea, et ſales. Et horum quædam ſunt raræ ſubſtantiæ et debilis compoſitionis, et quædam fortis ſubſtantiæ, et quædam ductibilia, et quædam non. *Avicenna de congelatione et conglutinatione lapidum*, Cap. 3. *Theatrum Chemicum*, t. iv. p. 997.

call *aggregates*; becauſe moſt of the minerals belonging to it conſiſt of various *ſimple ſtones*, cemented, as it were, together.

Order I. SIMPLE STONES.

21 Cronſtedt's genera. Cronstedt divided this order into nine genera, correſponding to nine earths; one of which he thought compoſed the ſtones arranged under each genus. The names of his genera were, *calcareæ, ſiliceæ, granatinæ, argillaceæ, micaceæ, fluores, aſbeſtinæ, zeolithicæ, magneſiæ.* All his earths were afterwards found to be compounds, except the firſt, ſecond, fourth, and ninth. Bergman, therefore, in his Sciagraphia, firſt publiſhed in 1782, reduced the number of genera to five; which was the 22 Improved. number of primitive earths known when he wrote. Since that period three new earths have been diſcovered. Accordingly, in the lateſt ſyſtems of mineralogy, the genera belonging to this order amount to eight. Each genus is named from an earth; and they are arranged in the neweſt Wernerian ſyſtem, which we have ſeen, as follows:

1. Jargon genus.
2. Siliceous genus.
3. Glucina genus.
4. Argillaceous genus.
5. Magneſian genus.
6. Calcareous genus.
7. Barytic genus.
8. Strontian genus.

Mr Kirwan, in his very valuable ſyſtem of mineralogy, has adopted the ſame genera. Under each genus, thoſe ſtones are placed, which are compoſed chiefly of the earth which gives a name to the genus, or which at leaſt are ſuppoſed to poſſeſs the characters which diſtinguiſh that earth.

23 Still deficient. A little conſideration will be ſufficient to diſcover that there is no natural foundation for theſe genera. Moſt ſtones are compoſed of two, three, or even four ingredients; and, in many caſes, the proportion of two or more of theſe is nearly equal. Now, under what genus ſoever ſuch minerals are arranged, the earth which gives it a name muſt form the ſmalleſt part of their compoſition. Accordingly, it has not been ſo much the chemical compoſition, as the external character, which has guided the mineralogiſt in the diſtribution of his ſpecies. The genera cannot be ſaid properly to have any character at all, nor the ſpecies to be connected by any thing elſe than an arbitrary title. This defect, which muſt be apparent in the moſt valuable ſyſtems of mineralogy, ſeems to have ariſen chiefly from an attempt to combine together an artificial and natural ſyſtem. As we have ſeparated theſe two from each other, it becomes neceſſary for us to attend more accurately to the natural diſtribution of genera than has hitherto been done. We have accordingly ventured to form new genera for this order, and we have formed them according to the following rules.

24 New genera. The only ſubſtances which enter into the minerals belonging to this order, in ſuch quantity as to deſerve attention, are the following:

Alumina,
Silica,
Magneſia,
Lime,
Barytes,
Glucina,
Zirconia,
Oxyd of iron,
Oxyd of chromum,
Potaſs.

All thoſe minerals which are compoſed of the *ſame* ingredients we arrange under the *ſame* genus. According to this plan, there muſt be as many genera as there are varieties of combinations of the above ſubſtances exiſting in nature. The varieties in the *proportion* of the ingredients conſtitute ſpecies. We have not impoſed names upon our genera, but, in imitation of Bergman,* have denoted each by a ſymbol. This ſymbol is compoſed of the firſt letter of every ſubſtance which enters in any conſiderable quantity into the compoſition of the minerals arranged under the genus denoted by it. Thus, ſuppoſe the minerals of a genus to be compoſed of *alumina, ſilica,* and *oxyd of iron,* we denote the genus by the ſymbol *aſi.* The letters are arranged according to the proportion of the ingredients; that which enters in the greateſt proportion being put firſt, and the others in their order. Thus the genus *aſi* is compoſed of a conſiderable proportion of alumina, of a ſmaller proportion of ſilica, and contains leaſt of all of iron. By this contrivance, the ſymbol of a genus contains, within the compaſs of a few letters, a pretty accurate deſcription of its nature and character. Where the proportions of the ingredients vary in the ſame genus ſo much, that the letters which conſtitute its ſymbol change their place, we ſubdivide the genus into parts; and whenever the minerals belonging to any genus become too numerous, advantage may be taken of theſe ſubdiviſions, and each of them may be formed into a ſeparate genus. At preſent this ſeems unneceſſary (e).

* *Opuſc.* iv. 231.

The following is a view of the different genera belonging to this order, denoted each by its ſymbol. Every genus is followed by the ſpecies included under it; and the whole are in the order which we mean to follow in deſcribing them:

I. A.
  Teleſia,
  Corundum,
  Native alumina.
II. AMC.
  Ruby.
III. AIM.
  Ceylanite,
IV. S.
  Quartz,
  Elaſtic quartz,
  Flint,
  Opal,
  Pitchſtone,
  Chryſopraſium.
V. 1. AS.
  Topaz,
  Sommite,
  Shorlite.
 2. SA.
  Rubellite,
  Hornſlate,
  Hornſtone,
  Chalcedony,
  Jaſper,
  Tripoli.
VI. 1. ASI.
  Micarell,
  Shorl,
  Granatite,
 2. SAI.
  Tourmaline,
  Argentine felſpar,
  Mica,
  Talc,
  Baſaltine,
  Hornblende,
  Obſidian,
  Petrilite,
  Felſite.
VII. SAP.
  Felſpar,
  Lepidolite,
  Leucite.
VIII. SAG.
  Emerald.
IX. SAB.
  Staurolite.
X. 1. ASL.
  Chryſoberyl.
 2. SAL.
  Hyalite,
  Ædelite.
 3. SAWL.

(e) We need hardly remark, that the laſt three genera of Werner belong to the ſecond order of the firſt claſs of this treatiſe.

Earths and Stones.

3. SAWL.
Zeolite,
Stilbite,
Analcime.
4. SLA.
Lazulite.
XI. SALI.
Garnet,
Thumerſtone,
Prehnite,
Thallite.
XII. 1. AMS.
Cyanite.
2. MSA.
Serpentine.
XIII. MSAL.
Pottſtone,
Chlorite.
XIV. SLAM.
Siliceous ſpar.
XV. SAMLI.
Argillite.
XVI. SM.
Kiffekill,
Steatites.
XVII. MSI.
Chryſolite,
Jade.
XVIII. SML.
Aſbeſtus,
Aſbeſtinite.
XIX. 1. SILM.
Pyroxen,
Aſbeſtoid.
2. SMIL.
Actinolite.
XX. SL.
Shiſtoſe horneſtone.
XXI. ZS.
Zircon.

* * *

25
G. I. s.
Telesia.

GENUS I. A.

SPECIES 1. Teleſia (F).

Oriental ruby, ſapphire, and *topaz* of mineralogiſts.—*Rubis d'orient* of De Liſle.

Three ſtones, diſtinguiſhed from each other by their colour, have long been held in high eſtimation on account of their hardneſs and beauty. Theſe ſtones were known amongſt lapidaries by the names of *ruby*, *ſapphire*, and *topaz*, and the epithet *oriental* was uſually added, to diſtinguiſh them from other three, known by the ſame names and the ſame colours, but very inferior in hardneſs and beauty. Mineralogiſts were accuſtomed to conſider theſe ſtones as three diſtinct ſpecies, till Romé de Liſle obſerved that they agreed in the form of their cryſtals, their hardneſs, and moſt of their other properties. Theſe obſervations were ſufficient to conſtitute them one ſpecies; and accordingly they were made one ſpecies by Romé de Liſle himſelf, by Kirwan, and ſeveral other modern mineralogical writers. But this ſpecies was deſtitute of a proper name, till Mr Hauy, whoſe labours, diſtinguiſhed equally by their ingenuity and accuracy, have contributed not a little to the progreſs of mineralogy, denominated it *teleſia*, from the Greek word τελειος, which ſignifies *perfect*.

The teleſia is found in the Eaſt Indies, eſpecially in Pegu and the iſland of Ceylon, and it is moſt commonly cryſtallized. The cryſtals are of no great ſize: Their *primitive* form, according to Mr Hauy, is a regular ſix-ſided priſm, diviſible in directions parallel both to its baſes and its ſides; and conſequently giving for the form of its primitive nucleus, or of its *integrant molecule*, an equilateral three ſided priſm.* The moſt uſual variety is a dodecahedron, in which the teleſia appears under the form of two very long ſlender ſix-ſided pyramids, joined baſe to baſe.† The ſides of theſe pyramids are iſoſceles triangles, having the angle at their vertex 22° 54′, and each of thoſe at the baſe 78° 48′ (G). The inclination of a ſide of one pyramid to a contiguous ſide of the other pyramid is 139° 54′.† In ſome ſpecimens the ſummits of the pyramids are wanting, ſo that the cryſtal has the appearance of a ſix-ſided priſm, ſomewhat thicker in the middle than towards the extremities.* The three alternate angles at each extremity of this priſm are alſo ſometimes wanting, and a ſmall triangular face inſtead of them, which renders the baſes of the ſuppoſed priſm nine-ſided. The inclination of each of theſe ſmall triangles to the baſe is 122° 18′.‡ For figures of theſe cryſtals we refer the reader to Romé de Liſle and Hauy.*

* *Ann. de Chim.* xvii. 313.
† Plate XXXVI. fig. 1.
† *Ibid.* and *Romé de Liſle*, ii. 515.
* Fig. 2.
‡ *Hauy, Ibid.*
* *Ibid.*

The texture of the teleſia is foliated, and the joints are parallel to the baſe of the priſm.† Its luſtre varies from 3 to 4 (H). Tranſparency uſually 3 or 4, ſometimes only 2. It cauſes only a ſingle refraction. Specific gravity from 4. to 4.288. Hardneſs from 15 to 17. It is either colourleſs, or red, yellow or blue. Theſe colours have induced lapidaries to divide the teleſia into the three following varieties.

† *Hauy.*

Variety 1. Red teleſia.
Oriental ruby.

Colour carmine red, ſometimes verging towards violet. Sometimes various colours appear in the ſame ſtone, as red and white, red and blue, orange red. Hardneſs 17. Sp. gr. 4.288.

Variety 2. Yellow teleſia.
Oriental topaz.

Colour golden yellow. Tranſp. 4. Hardneſs 15. Sp. gr. 4.0106.

Variety 3. Blue teleſia.
Oriental ſapphyr.

Colour Berlin blue, often ſo very faint that the ſtone appears almoſt colourleſs. Tranſp. 3, 4, 2. Hardneſs 17. Sp. gr. 3.991 to 4.083.‡ This variety is not probably the ſame with the ſapphyr of the ancients. Their ſapphyr was diſtinguiſhed by gold-coloured ſpots, none of which are to be ſeen in the ſapphyr of the moderns.‖

‡ *Greville, Nicholſon's Jour.* iii. 11.
‖ *Hill's Theophraſtus*, περι των λιθων, p. 100.

A ſpecimen of this laſt variety, analyſed by Mr Klaproth, was found to contain in 100 parts,

98.5 alumina,
1.0 oxyd of iron,
0.5 lime,

100.0*.

* *Beiträge*, i. 81.

The colouring matter of all theſe varieties is, according to Bergman's experiments, iron, in different ſtates of oxydation. He found that the topaz contained .06, the ruby .1, and the ſapphyr .02 of that metal.† But when theſe experiments were made, the analyſis of ſtones was not arrived at a ſufficient degree of perfection to enſure accuracy. No concluſion, therefore, can be drawn from theſe experiments, even though we were certain that they were made upon the real varieties of teleſia.

† *Bergman*, ii. 96.

SPECIES.

(F) See *Kirwan's Mineralogy*, I. 250.—*Gmelin's Syſtema Naturæ of Linnæus*, III. 170.—*Romé de Liſle's Cryſtallographie*, II. 212.—*Bergmanni Opuſcula*. II. 72.

(G) In ſome inſtances, the angle at the vertex is 31°, thoſe at the baſe 74° 30′, and the inclination of two triangles 122° 36′. See *Hauy, ibid.*

(H) When the *kind* of luſtre is not ſpecified, as in the preſent inſtance, the *common* is always meant.

26
Corundum.

SPECIES 2. Corundum (I).

Corundum of Gmelin—*Adamantine ſpar* of Klaproth and Kirwan—*Corindon* of Hauy—*Corivindum* of Woodward.

This ſtone, though it appears to have been known to Mr Woodward, may be ſaid to have been firſt diſtinguiſhed from other minerals by Dr Black. In 1768, Mr Berry, a lapidary in Edinburgh, received a box of it from Dr Anderſon of Madras. Dr Black aſcertained, that theſe ſpecimens differed from all the ſtones known to Europeans; and, in conſequence of its hardneſs, it obtained the name of *adamantine ſpar*. Notwithſtanding this, it could ſcarcely be ſaid to have been known to European mineralogiſts till Mr Greville of London, who has done ſo much to promote the ſcience of mineralogy, obtained ſpecimens of it, in 1784, from India, and diſtributed them among the moſt eminent chemiſts, in order to be analyſed. Mr Greville alſo learned, that its Indian name was Corundum. It is found in Indoſtan, not far from the river Cavery, which is ſouth from Madras, in a rocky matrix, of conſiderable hardneſs, partaking of the nature of the ſtone itſelf.* It occurs alſo in China; and a ſubſtance, not unlike the matrix of corundum, has been found in Teree, one of the weſtern iſlands of Scotland †.

* *Garrow* and *Greville*, *Nicholſon's Jour.* ii. 540.
† *Greville*, *ibid.*

The corundum is uſually cryſtallized. Its primitive form, diſcovered by Mr Hauy ‡ and the Count de Bournon,* is a rhomboidal parallelopiped, whoſe ſides are equal rhombs, with angles of 86° and 94°, according to Bournon, or whoſe diagonals are to each other as $\surd 17$ to $\surd 15$, according to Hauy; which is very nearly the ſame thing †. The moſt common variety, for the primitive form has never yet been found, is the regular ſix-ſided priſm, the alternate angles of which are ſometimes wanting ‖, and the triangular faces, which occupy their place, are inclined to the baſe at an angle of 122° 34′ ‡. Sometimes the corundum is cryſtallized in the form of a ſix-ſided pyramid, the apex of which is generally wanting. For a deſcription and figure of theſe, and all the other varieties of corundum hitherto obſerved, we refer the reader to the diſſertation of the Count de Bournon on the ſubject.*

‡ *Jour de Min.* N° xxviii. 262.
* *Nicholſon's Jour.* ii. 541.
† Fig. 3.
‖ Fig. 4.
‡ *De Bournon.*
* See alſo *Hauy Jour. de Min.* N° xxviii. 262.

The texture of the corundum is foliated, and the natural joints are parallel to the faces of the primitive rhomboidal parallelopiped. Luſtre, when in the direction of the laminæ, 3; when broken acroſs, 0. Opake, except when in very thin pieces. Hardneſs 15. Sp. gr. from 3.710 to 4.180 †. Colour grey, often with various ſhades of blue and green.

† *Klaproth.* See alſo *Mr Greville*, *Nicholſon's Jour.* iii. 11.

According to the analyſis of Klaproth, the corundum of India is compoſed of

89.5	alumina,
5.5	ſilica,
1.25	oxyd of iron,
96.25 ‡.	

‡ *Beiträge*, i. 77.

A ſpecimen from China of

84.0	alumina,
6.5	ſilica,
7.5	oxyd of iron,
98.0‖.	

‖ *Ibid.* i. 78.

Notwithſtanding the quantity of ſilica and of iron which theſe analyſes exhibit in the corundum, we have been induced to include it in the preſent genius, on account of the ſtrong reſemblance between it and the third variety of teleſia. The ſtriking reſemblance between the cryſtals of teleſia and corundum will appear evident, even from the ſuperficial deſcription which we have given; and the obſervations of De Bournon* render this reſemblance ſtill more ſtriking. It is not improbable, therefore, as Mr Greville and the Count de Bournon have ſuggeſted, that corundum may be only a variety of teleſia, and that the ſeeming difference in their ingredients is owing to the impurity of thoſe ſpecimens of corundum which have hitherto been brought to Europe. Let not the difference which has been found in the primitive form of theſe ſtones be conſidered as an inſuperable objection, till the ſubject has been again examined with this preciſe object in view; for nothing is eaſier than to commit an overſight in ſuch difficult examinations.

* *Nicholſon's Jour.* iii. 9.

27
Native alumina.

SPECIES 3. Native alumina (K).

This ſubſtance has been found at Halles in Saxony in compact kidney-form maſſes. Its conſiſtence is earthy. Luſtre 0. Opaque. Hardneſs 4. Brittle. Sp. gr. moderate. Feels ſoft, but meagre. Adheres very ſlightly to the tongue. Stains very ſlightly. Colour pure white. Does not readily diffuſe itſelf in water.

It conſiſts of pure alumina, mixed with a ſmall quantity of carbonat of lime, and ſometimes of ſulphat of lime †.

† *Schreber.*

28
G. II. AMC.
Ruby.

GENUS II. AMC.

SPECIES I Ruby (L).

Spinel and *balaſs Ruby* of Kirwan—*Ruby* of Hauy—*Rubis ſpinelle octoedre* of De Liſle—*Spinellus* of Gmelin.

This ſtone, which comes from the iſland of Ceylon, is uſually cryſtallized. The primitive form of its cryſtals is a regular octohedron, compoſed of two four-ſided pyramids applied baſe to baſe, each of the ſides of which is an equilateral triangle ‡ (M). In ſome caſes two oppoſite ſides of the pyramids are broader than the other two; and ſometimes the edges of the octohedron are wanting, and narrow faces in their place. For figures and deſcriptions of theſe, and other varieties of theſe cryſtals, we refer the reader to *Romé de Liſle* and the *Abbé Eſtner.**

‡ Fig. 5.
* *Cryſtall.* 2. 226. *Eſtner's Miner.* 75.

The texture of the ruby is foliated. Its luſtre is 3. Tranſp. 3.4. It cauſes a ſingle refraction. Hardneſs 13. Sp. gr. 3.570 † to 3.625 ‡. Colour red; if deep, the ruby is uſually called *balaſs*; if pale roſy, *ſpinell*. The

† *Klaproth.*
‡ *Hatchette* and *Greville.*

(I) See *Kirwan's Mineralogy*, I.—*Klaproth in Beob. der Berlin*, VIII. 295. and *Beiträge*, I. 47.—*Mr Greville* and the *Count de Bournon* in the *Philoſophical Tranſactions* 1798, p. 403. and in *Nicholſon's Journal*, II. 540. and III. 5.—*Mr Hauy Jour. de Phyſ.* XXX. 193. and *Jour de Min.* N° XXVIII. 262.

(K) See *Kirwan's Mineralogy*, I. 175, and *Schreber.* 15. *Stück*, p. 209.

(L) See *Kirwan's Min.* I. 253.—*Romé de Liſle*, II. 224.—*Klaproth Beob. der Berlin*, III. 336. and *Beitrage*, II. 1.—*Vauquelin Ann. de Chim.* XXVII. 3. and XXXI. 141.

(M) We ſhall afterwards diſtinguiſh this octohedron either by the epithet *regular* or *aluminiform*, becauſe it is the well known form of cryſtals of alum.

The ruby, according to the analyſis of Vauquelin, is compoſed of
86.00 alumina,
8.50 magneſia,
5.25 chromic acid.

99.75*

The ancients ſeem to have claſſed this ſtone among their hyacinths †.

Genus III. Aim.

29 G. III. Aim. Ceylanite.

Species 1. Ceylanite

The mineral denominated *ceylanite*, from the iſland of Ceylon, from which it was brought into Europe, had been obſerved by Romé de Liſle ‡; but was firſt deſcribed by La Metherie in the Journal de Phyſique for January 1793.

It is moſt commonly found in rounded maſſes; but ſometimes alſo cryſtallized. The primitive form of its cryſtals is a regular octohedron: it commonly occurs under this form, but more commonly the edges of the octohedron are wanting, and ſmall faces in their place ‡.

The fracture of the ceylanite is conchoidal.* Its internal luſtre is glaſſy. Nearly opaque, except when in very thin pieces. Hardneſs 12. Sp. gr. from 3.7647 † to 3.793 ‡. Colour of the maſs, black; of very thin pieces, deep green. Powder, greeniſh grey. According to the analyſis of Deſcotils the ceylanite is compoſed of
68 alumina,
16 oxyd of iron,
12 magneſia,
2 ſilica.

98 §.

30 G. IV. & Quartz.

Species 1. Quartz ‖.

This ſtone, which is very common in moſt mountainous countries, is ſometimes cryſtallized, and ſometimes amorphous. The primitive form of its cryſtals, according to Mr Hauy, is a rhomboidal parallelopiped; the angles of whoſe rhombs are 93° 22′, and 86° 38′; ſo that it does not differ much from a cube.* The moſt common variety is a dodecahedron ‡, compoſed of two ſix-ſided pyramids, applied baſe to baſe, whoſe ſides are iſoſceles triangles, having the angle at the vertex 40°, and each of the angles at the baſe 70°; the inclination of a ſide of one pyramid to the contiguous ſide of the other pyramid is 104°. There is often a ſix-ſided priſm interpoſed between the two pyramids, the ſides of which always correſpond with thoſe of the pyramids ‖. For a deſcription and figure of the other varieties of quartz cryſtals, and for a demonſtration of the law which they have followed in cryſtallizing, we refer the reader to *Romé de Liſle* † and *Mr Hauy* ‡.

The texture of quartz is more or leſs foliated. Fracture, conchoidal or ſplintery. Its luſtre varies from 3 to 1, and its tranſparency from 4 to 1; and in ſome caſes it is opaque. It cauſes a double refraction. Hardneſs, from 10 to 11. Sp. gr. from 2.64 to 2.67, and in one variety 2.691. Its colour is exceedingly various; a circumſtance which has induced mineralogiſts to divide it into numerous varieties. Of theſe the following are the chief.

1. Pure colourleſs, perfectly tranſparent cryſtallized quartz, having much the appearance of artificial cryſtal; known by the name of *rock cryſtal*.

2. Quartz leſs tranſparent, and with a ſplintery fracture, has uſually been diſtinguiſhed by the name of *quartz*, and ſeparated from rock cryſtal. As there is no occaſion for this ſeparation, we have, in imitation of Mr Hauy, choſen the word quartz for the *ſpecific name*, comprehending under it all the varieties.

3. Blood red quartz; formerly called *compoſtella hyacinth*, and by Hauy *quartz hematoide*. It owes its colour to oxyd of iron. The mineral known to mineralogiſts by the name of *ſinople*, and conſidered by them as a variety of *jaſper*, has been diſcovered by Dolomieu to be merely this variety of quartz in an amorphous ſtate.*

5. Yellow quartz; called falſe topaz.

5. Roſy red quartz; called Bohemian ruby.

For a fuller enumeration of theſe varieties, we refer the reader to *Smeiſſer's Mineralogy* †, *Kirwan's Mineralogy* ‡, and Gmelin's edition of the *Syſtema Naturæ* of Linnæus §. This laſt writer, however, has arranged ſeveral minerals under quartz which do not belong to it.

Pure quartz is compoſed entirely of ſilica; but ſome of the varieties of this ſpecies are contaminated with metallic oxyds, and with a ſmall quantity of other earths.

31 Elaſtic quartz.

Species 2. Elaſtic Quartz (N).

This ſingular ſtone is moderately elaſtic, and flexible in every direction. Texture, earthy. Luſtre, 0 or 1. Hardneſs, 9. Brittle. Sp. gr. 2.624. Colour, greyiſh white. Phoſphoreſces when ſcraped with a knife in the dark. The ſpecimen analyſed by Mr Klaproth contained
96.5 ſilica,
2.5 alumina,
5 oxyd of iron,

99.5 †

Species 3. Flint (O).

Pyromachus—Pierre a fuſil—Silex of Hauy.

32 Flint.

This ſtone, which has become ſo neceſſary in modern war, is found in pieces of different ſizes, and uſually of a figure more or leſs globular, commonly among chalk, and often arranged in ſome kind of order. In Saxony it is ſaid to have been found cryſtallized in hexahedrons, compoſed of two low three-ſided pyramids applied baſe to baſe.*

Its texture is compact. Its fracture, ſmooth conchoidal. Luſtre, external 0, the ſtones being always covered by a white cruſt; internal 1, inclining to greaſy. Tranſp. 2; when very thin, 3. Hardneſs, 10 or 11. Sp. gr. from 2.58 to 2.63. Colour varies from honey yellow to browniſh black. Very brittle, and ſplits into ſplinters in every direction. Two pieces of flint rubbed ſmartly together phoſphoreſce, and emit a peculiar odour. When heated it decrepitates, and becomes white and opaque. When expoſed long to the air

* *Ann. de Chim.* xxvii. 15.

† *Plin.* l. 37. c. 9.

‡ *Cryſtallog.* iii. 180. Note 21.

‡ *Hauy,*

* *Jour. de Min.* N° xxxviii. 294.

† *Ibid* 263.

‡ *Hauy.*

§ *Deſcotils.*

§ *Ann. de Chim.* xxiii. 113.

‖ *Kirwan's Min.* i. 241.

* *Jour. de Min.* N° xxviii. 255.

‡ Fig. 6.

‖ Fig. 7.

† *Cryſtal.* ii. 71.

‡ *Mem. Par.* 1786, p. 78. See alſo *Lametherie, Jour. de Phyſ.* xliii. 470.

* *Jour. de Min.* N° xxviii. 255.

† i. 89.

‡ i. 244.

§ iii. 194.

† *Beiträge,* ii. 116.

* *Gmelin's Syſtema Naturæ,* iii. 183.

(N) *Kirwan's Min.* I. 316—*Gerhard Mem. Berlin,* 1783, 107.—*Klaproth's Beitrage* 2 *Band.* 113. See alſo *Jour. d. Phyſ.* XLI. 91.

(O) *Kirwan's Min.* I. 301.—*Dolomieu Jour. de Min.* N° XXXIII. 693. and *Salivet, ibid.* 713. Theſe laſt gentlemen give the only accurate account of the method of making gun flints.

air it often becomes covered with a white cruſt. A ſpecimen of flint analyſed by Klaproth contained

98.00 ſilica,
.50 lime,
.25 alumina,
0.25 oxyd of iron,
1.00 water.

100.00†

Another ſpecimen analyſed by Dolomieu was compoſed of

97 ſilica,
1 alumina and oxyd of iron,
2 water.

100‡

The white cruſt with which flint is enveloped, conſiſts of the ſame ingredients, and alſo a little carbonat of lime. Dolomieu diſcovered that water is eſſential to flint; for when it is ſeparated by heat the ſtone loſes its properties§.

The manufacture of gun flints is chiefly confined to two or three departments in France. The operation is exceedingly ſimple: a good workman will make a 1000 flints in a day. The whole art conſiſts in ſtriking the ſtone repeatedly with a kind of mallet, and bringing off at each ſtroke a ſplinter, ſharp at one end and thicker at the other. Theſe ſplinters are afterwards ſhaped at pleaſure, by laying the line at which it is wiſhed they ſhould break, upon a ſharp iron inſtrument, and then giving it repeatedly ſmall blows with a mallet. During the whole operation the workman holds the ſtone in his hand, or merely ſupports it on his knee||.

† Beiträge, i. 46.
‡ Jour. de Min. N° xxxiii. 702.
§ Ibid.
|| Ibid.

33 Opal.

SPECIES 4. Opal (P).

This ſtone is found in many parts of Europe. It is uſually amorphous. Its fracture is conchoidal, commonly ſomewhat tranſparent. Hardneſs from 6 to 10. Sp. gr. from 1.7 to 2.66. The lowneſs of its ſpecific gravity, in ſome caſes, is to be aſcribed to accidental cavities which the ſtone contains. Theſe are ſometimes filled with drops of water. Some ſpecimens of opal have the property of emitting various coloured rays, with a particular effulgency, when placed between the eye and the light. The opals which poſſeſs this property, are diſtinguiſhed by lapidaries by the epithet *oriental;* and often by mineralogiſts by the epithet *nobilis*. This property rendered the ſtone much eſteemed by the ancients.

Variety 1. Opal edler—*Opalus nobilis*.

Luſtre glaſſy, 3. Tranſp. 3 to 2. Hardneſs, 6 to 8. Colour, uſually light bluiſh white, ſometimes yellow or green. When heated it becomes opaque, and ſometimes is decompoſed by the action of the atmoſphere. Hence it ſeems to follow, that water enters eſſentially into its compoſition. A ſpecimen of this variety, analyſed by Klaproth, contained

90 ſilica,
10 water.

100¶

¶ Beiträge, ii. 153.

Variety 2. Semi-opal.

Fracture, imperfectly conchoidal. Luſtre, glaſſy 2. Tranſp. 2 to 3. Hardneſs, 7 to 9. Its colours are very various, greys, yellows, reds, browns, greens of different kinds.

Specimens of this variety ſometimes occur with rifts: theſe readily imbibe water, and therefore adhere to the tongue. Theſe ſpecimens ſometimes become tranſparent when ſoaked in water, by imbibing that fluid. They are then called *hydrophanes*.

Variety 3. Cat's eye*.

This variety comes from Ceylon, and is ſeldom ſeen by European mineralogiſts till it has been poliſhed by the lapidary. Mr Klaproth has deſcribed a ſpecimen which he received in its natural ſtate from Mr Greville of London. Its figure was nearly ſquare, with ſharp edges, a rough ſurface, and a good deal of brilliancy.

Its texture is imperfectly foliated. Luſtre greaſy, 2. Tranſp. 3 to 2. Hardneſs 10. Sp. gr. 2.56 to 2.66. Colour, grey; with a tinge of green, yellow or white: or brown, with a tinge of yellow or red. In certain poſitions it reflects a ſplendid white, as does the eye of a cat; hence the name of this ſtone.

Two ſpecimens, analyſed by Klaproth, the firſt from Ceylon, the other from Malabar, were compoſed of

95.00	94.50 ſilica,
1.75	2.00 alumina,
1.50	1.50 lime,
0.25	0.25 oxyd of iron.
98.5 *	98.25†.

* Kirwan's Min. i. 301. Klaproth, Beiträge, i. 90.
* Beiträge, i. 94.
† Ibid. p. 96.

34 Pitchſtone.

SPECIES 5. Pitchſtone§.

Menelites.

This ſtone, which occurs in different parts of Germany, France, and other countries, has obtained its name from ſome reſemblance which it has been ſuppoſed to have to pitch. It is moſt uſually in amorphous pieces of different ſizes; and it has been found alſo cryſtallized in ſix-ſided priſms, terminated by three-ſided pyramids.

Its texture is conchoidal and uneven, and ſometimes approaches the ſplintery. Luſtre greaſy, from 3 to 1. Tranſp. 2 to 1, ſometimes 0. Hardneſs 8 to 10. Exceedingly brittle; it yields even to the nail of the finger. Sp. gr. 2.049 to 2.39. Its colours are numerous, greyiſh black, bluiſh grey, green, red, yellow of different ſhades. Sometimes ſeveral of theſe colours appear together in the ſame ſtone. A ſpecimen of pitchſtone from Meſnil-montant near Paris*, analyſed by Mr Klaproth, contained

85.5 ſilica,
11.0 air and water,
1.0 alumina,
.5 iron,
.5 lime and magneſia.

98.5†

§ Kir. Min. i. 292.—Daubanton, Mem. Par. 1787, p. 86.
* See Jour. de Phyſ. xxxi. 219.
† Beiträge, ii. 169.

35 Chryſopraſium.

SPECIES 6. Chryſopraſium (Q).

This mineral, which is found in different parts of Germany, particularly near Koſemütz in Sileſia, is always amorphous. Its fracture is either even or inclining to the ſplintery. Scarcely any luſtre. Tranſp. 2 to 3. Hardneſs 10 to 12. Sp. gr. 2.479. Colour, green. In a heat of 130° Wedgewood it whitens and becomes opaque.

(P) *Kirwan's Min.* I. 289.—*Hauy, Jour. d' Hiſt. Nat.* II. 9. *Delius. Nouv. Jour. de Phyſ.* I. 45.
(Q) *Kirwan's Min.* I.—*Lehmann. Mem. Berlin.* 1755. *p.* 202.—*Klaproth Beitrage,* II. 127.

A ſpecimen of this ſtone, analyſed by Mr Klaproth, contained
96.16 ſilica,
1.00 oxyd of nickel,
0.83 lime,
0.08 alumina,
0.08 oxyd of iron.

98.15‡

‡ Beitrage, ii. 133.

36
G. V. 1 AS.
Topaz.

Genus V. 1. AS.

Species 1. Topaz (R).

Occidental ruby, *topaz*, and *ſapphyr*.

The name *topaz* has been reſtricted by Mr Hauy to the ſtones called by mineralogiſts occidental ruby, topaz, and ſapphyr; which, agreeing in their cryſtallization and moſt of their properties, were arranged under one ſpecies by Mr Romé de Liſle. The word *topaz*, derived from an iſland in the Red Sea (S), where the ancients uſed to find topazes, was applied by them to a mineral very different from ours. One variety of our topaz they denominated *chryſolite*.

The topaz is found in Saxony, Bohemia, Siberia, and Brazil, mixed with other minerals in granite rocks.

It is commonly cryſtallized. The primitive form of its cryſtals is a priſm whoſe ſides are rectangles, and baſes rhombs, having their greateſt angles 124° 22′, and the integral molecule has the ſame form*; and the height of the priſm is to a ſide of the rhomboidal baſes as 3 to 2‡. The different varieties of topaz cryſtals hitherto obſerved, amount to 6. Five of theſe are eight-ſided priſms, terminated by four-ſided pyramids, or wedge-ſhaped ſummits, or by irregular figures of 7, 13, or 15 ſides||; the laſt variety is a twelve-ſided priſm, terminated by ſix-ſided pyramids wanting the apex. For an accurate deſcription and figure of theſe varieties we refer the reader to Mr Hauy†.

* Hauy, Jour. de Min. N° xxviii. 287.
‡ Fig. 8.
|| Fig. 9.
† Jour. de Min. ibid.

The texture of the topaz is foliated. Its luſtre is from 2 to 4. Tranſp. from 2 to 4. It cauſes a double refraction. Hardneſs 12 to 14. Sp. gr. from 3.5311 to 3.564. The Siberian and Brazil topazes, when heated, become poſitively electrified on one ſide, and negatively on the other§. It is infuſible by the blow-pipe. The yellow topaz of Brazil becomes red when expoſed to a ſtrong heat in a crucible; that of Saxony becomes white by the ſame proceſs. This ſhews us, that the colouring matter of theſe two ſtones is different.

§ Hauy, ibid.

The colour of the topaz is various, which has induced mineralogiſts to divide it into the following varieties:

1. Red topaz, of a red colour inclining to yellow; called *Brazilian* or *occidental ruby*.

2. Yellow topaz, of a golden yellow colour, and ſometimes alſo nearly white; called *occidental* or *Brazil topaz*. The powder of this and the following variety cauſes ſyrup of violets to aſſume a green colour||.

|| Vauquelin, Jour. de Min. N° xxx. 165.

3. *Saxon topaz.* It is of a pale wine yellow colour, and ſometimes greyiſh white.

4. *Aigue marine.* It is of a bluiſh or pale green colour.

5. *Occidental ſapphyr.* It is of a blue colour; and ſometimes white.

A ſpecimen of white Saxon topaz, analyſed by Vauquelin, contained
68 alumina,
31 ſilica.

99¶

¶ Jour. de Min. N° xxiv. 3.

37
Sommite.

Species 2. Sommite.

This ſtone was called ſommite by La Metherie, from the mountain Somma, where it was firſt found. It is uſually mixed with volcanic productions. It cryſtallizes in ſix-ſided priſms, ſometimes terminated by pyramids. Colour white. Somewhat tranſparent. Sp. gr. 3.2741. Infuſible by the blow-pipe. According to the analyſis of Vauquelin, it is compoſed of
49 alumina,
46 ſilica,
2 lime,
1 oxyd of iron.

98*

* Ibid. N° xxviii. 279.

38
Shorlite.

Species 3. Shorlite†.

† Kirwan's Min. i. 286.

This ſtone, which received its name from Mr Klaproth, is generally found, in irregular oblong maſſes or columns, inſerted in granite. Its texture is foliated. Fracture uneven. Luſtre 2. Tranſparency 2 to 1. Hardneſs 9 to 10. Sp. gr. 3.53. Colour greeniſh white, or ſulphur yellow. Not altered by heat. According to the analyſis of Klaproth, it is compoſed of
50 alumina,
50 ſilica.

100

39
G. V. 2 SA.
Rubellite.

Genus V. 2. SA.

Species 4. Rubellite (T).

Red ſhorl of Siberia.

This ſtone is found in Siberia mixed with white quartz. It is cryſtallized in ſmall needles, which are grouped together and traverſe the quartz in various directions. Texture fibrous. Fracture even, inclining to the conchoidal. Tranſparency 2; at the edges 3. Hardneſs 10. Brittle. Sp. gr. 3.1. Colour crimſon, blood or peach red. By expoſure to a red heat it becomes ſnow white; but loſes none of its weight. It tinges ſoda blue, but does not melt with it.

According to the analyſis of Mr Bindheim, it is compoſed of
57 ſilica,
35 alumina,
5 oxyds of iron and mangeneſe.

97

40
Hornſlate.

Species 5. Hornſlate (U).

Shiſtoſe porphyry.

This ſtone, which occurs in mountains, is generally amorphous; but ſometimes alſo in columns. Struc-

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(R) *Kirwan's Min.* I. 254.—*Pott. Mem. Berlin*, 1747, *p.* 46.—*Margraf, ibid.* 1776. *p.* 73. and 160.—*Henkel. Act. Acad. Nat. Cur.* IV. 316.

(S) It got its name from *τοπαζω*, *to ſeek*; becauſe the iſland was often ſurrounded with fog, and therefore difficult to find. See *Plinii lib.* 37. *c.* 8.

(T) *Kirwan's Min.* I. 288. *Bindheim. Crell's Annals*, 1792, *p.* 320.

(U) *Kirwan's Min.* I. 307.—*Wiegleb. Crell's Annals*, 1787, 1 *Band.* 302.—See alſo *Reuſs. Samml. Natur. Hiſt. Aufsäze*, *p.* 207.

ture ſlaty. Texture foliated. Fracture uneven and ſplintery; ſometimes approaching the conchoidal. Luſtre 0. Tranſparency 1 or 0. Hardneſs about 10. Sp. gr. from 2.512 to 2.7. Colour different ſhades of *grey*, from *aſh* to *bluiſh* or *olive green*. Melts at 145° Wedgewood into an enamel. A ſpecimen, analyſed by Wedgewood, contained
73.0 ſilica,
23.9 alumina,
3.5 iron.

100.4

41 Hornſtone.

SPECIES 6. Hornſtone (x).

Petroſilex—Chert.

This ſtone, which makes a part of many mountains, is uſually amorphous; but, as Mr Kirwan informs us, it has been found cryſtallized by Mr Beyer on Schneeberg. Its cryſtals are ſix-ſided priſms, ſometimes terminated by pyramids; hexahedrons, conſiſting of two three-ſided pyramids applied baſe to baſe; and cubes, or ſix-ſided plates.* Its texture is foliated. Fracture ſplintery, and ſometimes conchoidal. Luſtre 0. Tranſparency 1 to 2. The cryſtals are ſometimes opaque. Hardneſs 7 to 9. Sp. gr. 2.532 to 2.653. Colour uſual dark blue: but hornſtone occurs alſo of the following colours; grey, red, blue, green, and brown of different ſhades.†

* *Kirwan*, i. 303.

† *Schmeiſſer's Min.* i. 103.

According to Kirwan, it is compoſed of
72 ſilica,
22 alumina,
6 carbonat of lime.

100‡

‡ *Ibid.* p. 305.

42 Chalcedony.

SPECIES 7. Chalcedony.

This ſtone is found abundantly in many countries, particularly in Iceland and the Faro iſlands. It is moſt commonly amorphous, ſtalactitical, or in rounded maſſes; but it occurs alſo cryſtallized in ſix-ſided priſms, terminated by pyramids, or more commonly in four or ſix-ſided pyramids, whoſe ſides are convex. Surface rough. Fracture more or leſs conchoidal. Luſtre 1. Somewhat tranſparent. Hardneſs 10 to 11. Sp. gr. 2.56 to 2 665. Not brittle.

According to Bergman, the chalcedony of Faroe is compoſed of
84 ſilica,
16 alumina, mixed with iron.

100

Variety 1. Common chalcedony.

Fracture even, inclining to conchoidal. Tranſparency 2 to 3; ſometimes 1. Its colours are various; it is moſt commonly greyiſh, with a tint of yellow, green, blue, or pearl; often alſo white, green, red, yellow, brown, black, or dotted with red. When ſtriped white and black, or brown, alternately, it is called *onyx*; when ſtriped white and grey, it is called *chalcedonix*. Black or brown chalcedony, when held between the eye and a ſtrong light, appears dark red.

Variety 2. Cornelian.

Fracture conchoidal. Tranſparency 3 to 1; often cloudy. Its colours are various ſhades of red, brown, and yellow. Several colours often appear in the ſame maſs. To this variety belong many of the ſtones known by the name of *Scotch pebbles*.

43 Jaſper.

SPECIES 8. Jaſper (y).

This ſtone is an ingredient in the compoſition of many mountains. It occurs uſually in large amorphous maſſes, and ſometimes alſo cryſtallized in ſix-ſided irregular priſms. Its fracture is conchoidal. Luſtre from 2 to 0. Either opaque, or its tranſparency is 1. Hardneſs 9 to 10. Sp. gr. from 2.5 to 2 82. Its colours are various. When heated, it does not decrepitate. It ſeems to be compoſed of ſilica and alumina, and often alſo contains iron.

Variety 1. Common jaſper.

Sp. gr. from 2.58 to 2.7. Its colours are, different ſhades of white, yellow, red, brown, and green; often variegated, ſpotted, or veined, with ſeveral colours.

Variety 2. Egyptian pebble.

This variety is found chiefly in Egypt. It uſually has a ſpheroidal or flat rounded figure, and is enveloped in a coarſe rough cruſt. It is opaque. Hardneſs 10. Sp. gr. 2.564. It is chiefly diſtinguiſhed by the variety of colours, which always exiſt in the ſame ſpecimen, either in concentric ſtripes or layers, or in dots or dendritical figures. Theſe colours are, different browns and yellows, milk white, and iſabella green; black alſo has been obſerved in dots.

Variety 3. Striped jaſper.

This variety is alſo diſtinguiſhed by concentric ſtripes or layers of different colours: theſe colours are, yellow, browniſh red, and green. It is diſtinguiſhed from the laſt variety by its occurring in large amorphous maſſes, and by its fracture, which is nearly even.

44 Tripoli.

SPECIES 9. Tripoli.

This mineral is found ſometimes in an earthy form, but more generally indurated. Its texture is earthy. Its fracture often ſomewhat conchoidal. Luſtre 0. Generally opaque. Hardneſs 4 to 7. Sp. gr. 2.080 to 2.529. Abſorbs water. Feel, harſh dry. Hardly adheres to the tongue. Takes no poliſh from the nail. Does not ſtain the fingers. Colour generally pale yellowiſh grey, alſo different kinds of yellow, brown, and white.

It contains, according to Haaſſe, 90 parts of ſilica, 7 alumina, and 3 of iron. A mineral belonging to this ſpecies was analyſed by Klaproth, and found to contain
66.5 ſilica,
7.0 alumina,
2.5 oxyd of iron,
1.5 magneſia,
1.25 lime,
19. air and water.

97.75

45 G. VI. 1. Asi. Micarell.

GENUS VI. I. ASI.

SPECIES 1. Micarell.*

This name has been given by Mr Kirwan to a ſtone which former mineralogiſts conſidered as a variety of mica. It is found in granite. Its texture is foliated, and

* *Kirwan's Min* i. 212.

(x) *Kirwan's Min.* I. 303.—*Baumer Jour. de Phyſ.* II. 154. and *Monnet, ibid.* 331.—*Wiegleb. Crell's Annals*, 1788, *p.* 45 and 135.

(y) *Kirw. Min.* I. 309.—*Borral Hiſt. Natur. de Corſe.*—*Henkel Act. Acad. Nat. Curios.* V. 339.

and it may be ſplit into thin plates. Luſtre metallic, 3. Opaque. Hardneſs 6. Sp. gr. 2.980. Colour browniſh black. At 153° Wedgewood, it melts into a black compact glaſs, the ſurface of which is reddiſh.†

† Kirwan, [illegible]

A ſpecimen analyſed by Klaproth contained

63.00	alumina,
29.50	ſilica,
6.75	iron.
99.25	

46 Shorl.

SPECIES 2. Shorl.‡

No word has been uſed by mineralogiſts with leſs limitation than *ſhorl*. It was firſt introduced into mineralogy by Cronſtedt, to denote any ſtone of a columnar form, conſiderable hardneſs, and a ſpecific gravity from 3 to 3.4. This deſcription applied to a very great number of ſtones. And ſucceeding mineralogiſts, though they made the word more definite in its ſignification, left it ſtill ſo general, that under the deſignation of *ſhorl* almoſt 20 diſtinct ſpecies of minerals were included.

‡ Kirw. i. [illegible]

Mr Werner firſt defined the word *ſhorl* preciſely, and reſtricted it to one ſpecies of ſtones. We uſe the word in the ſenſe aſſigned by him.

Shorl is found abundantly in mountains, either maſſive or cryſtallized, in three or nine-ſided priſms, often terminated by three-ſided ſummits. The ſides of the cryſtals are longitudinally ſtreaked. Its texture is foliated. Its fracture conchoidal. Luſtre 2. Opaque. Hardneſs 10. Sp. gr. 2.92 to 3.212. Colour black. Streak grey. It does not become electric by heat. When heated to redneſs, its colour becomes browniſh red; and at 127° Wedgewood, it is converted into a browniſh compact enamel.* According to Wiegleb, it is compoſed of

41.25	alumina,
34.16	ſilica,
20.00	iron,
5.41	mangancſe.
100.82 †	

* Ibid. i. 166.

† Crell's [illegible], I. [illegible] 4. [illegible], p. 21.

47 Granatite.

SPECIES 5. Granatite.

Staurotide of Hauy—*Pierre de Croix* of De Liſle—*Stauro'ithe* of Lametherie.

We have adopted from Mr Vauquelin the term *granatite* to denote this ſtone, becauſe all the other names are ambiguous, having been applied to another mineral poſſeſſed of very different properties.

Granatite is found in Galicia in Spain, and Britanny in France. It is always cryſtallized in a very peculiar form; two ſix-ſided priſms interſect each other, either at right angles or obliquely.‡ Hence the name *croiſſtone*, by which it was known in France and Spain.* Mr Hauy has proved, in a very ingenious manner, that the primitive form of the granatite is a rectangular priſm, whoſe baſes are rhombs, with angles of $129\frac{1}{2}°$ and $50\frac{1}{2}°$; and that the height of the priſm is to the greater diagonal of a rhomb as 1 to 6; and that its integrant molecules are triangular priſms, ſimilar to what would be obtained by cutting the primitive cryſtal in two, by a plane paſſing vertically through the ſhorter diagonal of the rhomboidal baſe. From this ſtructure he has demonſtrated the law of the formation of the cruciform varieties.* The colour of granatite is greyiſh or reddiſh brown.

‡ Fig. 10.

* Ann. de Chim. [illegible] 412.

* Ann. de Chim. vi. 142.

According to the analyſis of Vauquelin, it is compoſed of

47.06	alumina,
30.59	ſilica,
15.30	oxyd of iron,
3.00	lime,
95.95 †	

† Ibid. xxx. 106.

48 G. VI. 2. SAL. Tourmaline.

GENUS VI. 2. SAL.

SPECIES 4. Tourmaline (z).

This ſtone was firſt made known in Europe by ſpecimens brought from Ceylon; but it is now found frequently forming a part of the compoſition of mountains. It is either in amorphous pieces, or cryſtallized in three or nine-ſided priſms, with four-ſided ſummits.

Its texture is foliated: Its fracture conchoidal. Internal luſtre 2 to 3. Tranſparency 3 to 4; ſometimes only 2 (A). Cauſes only ſingle refraction.* Hardneſs 9 to 11. Sp. gr. 3.05 to 3.155. Colour brown, often ſo dark that the ſtone appears black; the brown has alſo ſometimes a tint of green, blue, red, or yellow.

* Hauy, Jour. de Min. N° xxviii. 265.

When heated to 200° Fahrenheit, it becomes electric; one of the ſummits of the cryſtal negatively, the other poſitively.† It reddens when heated; and is fuſible *per ſe* with intumeſcence into a white or grey enamel.

† Æpinus.

A ſpecimen of the tourmaline of Ceylon, analyſed by Vauquelin, was compoſed of

40	ſilica,
39	alumina,
12	oxyd of iron,
4	lime,
2.5	oxyd of mangancſe,
97.5 ‡.	

‡ Ann. de Chim. xxx. 105.

49 Argentine felſpar.

SPECIES 5. Argentine felſpar.§

§ Kirwan, i. 327.

This ſtone was diſcovered by Mr Dodun in the black mountains of Languedoc. It is either amorphous, or cryſtallized in rhomboidal tables, or ſix or eight-ſided priſms. Its texture is foliated. Fragments rectangular. Laminæ inflexible. Internal luſtre 4. Tranſparency 2. Colour white; two oppoſite faces of the cryſtals are ſilver white, two others dead white. Hardneſs of the ſilvery laminæ 6, of the reſt 9. Brittle. Sp. gr. 2.5. When the flame of the blow-pipe is directed againſt the edges of the cryſtal (ſtuck upon glaſs), it eaſily melts into a clear compact glaſs; but when the flame is directed againſt the faces, they preſerve their luſtre, and the edges alone ſlowly melt.

According to the analyſis of Dodun, it is compoſed of

46	ſilica,
36	alumina,
16	oxyd of iron,
98	

When this ſtone is expoſed to the atmoſphere, it is

(z) *Kirw.* I. 271.—*Berg.* II. 118. and V. 402.—*Gerhard. Mem. Berlin*, 1777, p. 14.—*Hauy Mem. Par.* 1784, 270.—*Wilſon Phil. Tranſ.* XLI. 308.—*Æpinus. Recueil ſur la Tourmaline.* See alſo *La Porterie. Le Sapphir, l'Oeil de Chat, et la Tourmaline de Ceylon demaſqués.*

(A) And when black only 1.

apt to decay: Its ſurface becomes irideſcent, and at laſt changes to ochre yellow: Its ſpecific gravity is 2.3 or 2.212; and when breathed upon, it gives out an earthy ſmell.

50 Mica.

‖ *Kirw.* i. 210—*Gmelin, Nov. Com. Petropol.* xii. 549.

SPECIES 6. Mica ‖.

This ſtone forms an eſſential part of many mountains, and has been long known under the names of *glacies mariæ* and *Muſcovy glaſs*. It conſiſts of a great number of thin laminæ adhering to each other ſometimes of a very large ſize. Specimens have been found in Siberia nearly $2\frac{1}{2}$ yards ſquare (B).

It is ſometimes cryſtallized: Its primitive form is a rectangular priſm, whoſe baſes are rhombs, with angles of 120° and 60° †: Its integrant molecule has the ſame form. Sometimes it occurs in rectangular priſms, whoſe baſes alſo are rectangles, and ſometimes alſo in ſhort ſix-ſided priſms †; but it is much more frequently in plates or ſcales of no determinate figure or ſize.*

† Fig. 11.

† Fig. 12.

* *Hauy, Jour. de Min.* N° xxviii. 296.

Its texture is foliated. Its fragments flat. The lamellæ flexible, and ſomewhat elaſtic. Luſtre metallic, from 3 to 4. Tranſparency of the laminæ 3 or 4, ſometimes only 2 (C). Hardneſs 6. Very tough. Often abſorbs water. Sp. gr. from 2.6546 to 2.9342. Feels ſmooth, but not greaſy. Powder feels greaſy. Colour, when pureſt, ſilver white or grey; but it occurs alſo yellow, greeniſh, reddiſh, brown, and black. Mica is fuſible by the blow-pipe into a white, grey, green, or black, enamel; and this laſt is attracted by the magnet (D). Spaniſh wax rubbed by it becomes negatively electric.*

* *Ibid.*

A ſpecimen of mica, analyſed by Vauquelin, contained

50.00 ſilica,
35.00 alumina,
7.00 oxyd of iron,
1.35 magneſia,
1.33 lime,

94.68 †.

† *ibid.* 302.

Mica has long been employed as a ſubſtitute for glaſs. A great quantity of it is ſaid to be uſed in the Ruſſian marine for panes to the cabin windows of ſhips; it is preferred, becauſe it is not ſo liable as glaſs to be broken by the agitation of the ſhip.

51 Talc.

‡ *Kirw.* i. 150.—*Pott. Mem. Berl.* 1746, p. 65.

SPECIES 7. Talc ‡.

This ſtone has a very ſtrong reſemblance to mica, and was long conſidered as a mere variety of that mineral. It occurs ſometimes in ſmall looſe ſcales, and ſometimes in an indurated form; but it has not hitherto been found cryſtallized.

Its texture is foliated. The lamellæ are flexible, but not elaſtic. Its luſtre is from 2 to 4. Tranſparency from 2 to 4. Hardneſs 4 to 6. Sp. gr. when indurated, from 2.7 to 2.8. Feels greaſy. Colour moſt commonly whitiſh or greeniſh. Spaniſh wax rubbed with it becomes *poſitively* electric §.

§ *Hauy, Jour. de Min.* N° xxviii. 291.

Variety 1. Scaly talc.
Talcite of Kirwan.

This variety occurs under the form of ſmall ſcales, ſcarcely cohering. Luſtre 3 to 4. Very light. Adheres to the fingers. When rubbed upon the ſkin, it gives it a gloſs. Colour white, with a ſhade of red or green; ſometimes leek green.

Variety 2. Common talc.
Venetian talc.

This variety often occurs in oblong nodules. Luſtre, nearly metallic, 4. Tranſparency 2 to 3; when very thin 4. Hardneſs 4 to 5. Colour white, with a ſhade of green or red; or apple green, verging towards ſilver white. By tranſmitted light, green.

Variety 3. Shiſtoſe talc.

Its ſtructure is ſlaty. Fracture hackly and long ſplintery. Eaſily crumbles when rubbed in the fracture. External luſtre 2 to 3; internal, 1; but ſometimes, in certain poſitions, 3. Colour grey, with a ſhade of white, green or blue. Becomes white and ſcaly when expoſed to the air.

A ſpecimen of *common talc*, analyſed by Mr Chenevix, contained

48.0 ſilica,
37.0 alumina,
6.0 oxyd of iron,
1.5 magneſia,
1.5 lime,
5.0 water,

99.0.*

* *Ann. de Chim.* xxviii. 200.

52 Baſaltine.

† *Kirw.* i. 219.

SPECIES 8. Baſaltine †.

Baſaltic hornblende of Werner—*Actinote* of Hauy—*Zillertite* of Lametherie—*Shorl priſmatique hexagone* of Sauſſure.

This ſtone is found commonly in baſaltic rocks; hence its name, which we have borrowed from Mr Kirwan. It is cryſtallized, either in rhomboidal priſms, or ſix or eight-ſided priſms, terminated by three-ſided pyramids. Its texture is foliated. Its fracture uneven. Luſtre 3. Tranſparency, when in very thin plates, 1. Hardneſs from 9 to 10. Sp. gr. 3.333. Colour black, dark green, or yellowiſh green. Streak white. Tranſmits a reddiſh yellow light. Before the blow-pipe, it melts into a greyiſh coloured enamel, with a tint of yellow †. A ſpecimen, ſeemingly of this ſtone, analyſed by Bergman, contained

58 ſilica,
27 alumina,
9 iron,
4 lime,
1 magneſia,

99 ‡.

† *Le Lievre, Jour. de Min.* N° xxviii. 269.

‡ *Berg.* iii. 207.

53 Hornblende.

¶ *Kirw.* i. 213.

SPECIES 9. Hornblende ¶.

Amphibole of Hauy (E).

This ſtone enters into the compoſition of various mountains. Its texture is very conſpicuouſly foliated. Fracture conchoidal. Fragments often rhomboidal. Luſtre 2. Opaque. Hardneſs 5 to 9. Tough. Sp. gr. 2.922 to 3.41. Colour black, blackiſh green, olive green,

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(B) *Hiſt. General de Voyages*, T. XVIII. 272, quoted by Hauy *Jour. de Min.* N° XXVIII. 299.

(C) Black mica is often nearly opaque.

(D) *Hauy, ibid.* p. 295. Bergman, however, found pure mica infuſible *per ſe*; and this has been the caſe with all the ſpecimens of Muſcovy glaſs which we have tried.

(E) We ſuſpect, that under this name Mr Hauy comprehends *ſhorl* alſo.

green, or leek green. Streak greeniſh. It neither becomes electric by friction nor heat.* Before the blow-pipe it melts into a black glaſs. A ſpecimen of black hornblende, analyſed by Mr Hermann, was compoſed of

37 ſilica,
27 alumina,
25 iron,
5 lime,
3 magneſia,

97 †

SPECIES 10. Reſplendent Hornblende

54 Reſplendent hornblende.

There are two minerals which Werner conſiders as varieties of hornblende, and Mr Kirwan as conſtituting a diſtinct ſpecies. Theſe, till future analyſes decide the point, we ſhall place here under the name of reſplendent hornblende, the name given them by Mr Kirwan; and we ſhall deſcribe them ſeparately.

Variety 1. Labradore hornblende.

Texture, curved foliated. Luſtre, in ſome poſitions, 0; in others metallic, and from 3 to 4. Opaque. Hardneſs 8 to 9. Sp. gr. from 3.35 to 3.434. Colour, in moſt poſitions, greyiſh black; in others, it reflects a ſtrong iron grey, ſometimes mixed with copper red.

Variety 2. Shiller ſpar.*

Texture foliated. Luſtre metallic, 4. Tranſparency, in thin pieces, 1. Hardneſs 8 to 9. Sp. gr. 2.882. Colour green, often with a ſhade of yellow; alſo golden yellow. In ſome poſitions it reflects white, grey, or yellow. At 141° Wedgewood, hardened into a porcelain maſs. A ſpecimen, analyſed by Gmelin, was compoſed of

43.7 ſilica,
17.9 alumina,
23.7 iron,
11.2 magneſia.

96.5 †.

It has been found in the Hartz, ſtuck in a ſerpentine rock.

SPECIES 11. Obſidian ‖.

55 Obſidian.

Iceland agate.

This ſtone is found either in detached maſſes, or forming a part of the rocks which compoſe many mountains. It is uſually inveſted with a grey or opaque cruſt. Its fracture is conchoidal. Its internal luſtre 3. Tranſparency 1. Hardneſs 10. Sp. gr. 2.348. Colour black or greyiſh black; when in very thin pieces, green. It melts into an opaque grey maſs. According to Bergman, it is compoſed of

69 ſilica,
22 alumina,
9 iron.

100 §.

SPECIES 12. Petrilite.*

56 Petrilite.

Cubic felſpar.

This ſtone is found in the maſs of mountains. It is amorphous. Texture foliated. Fracture ſplintery. Fragments cubic, or inclining to that form; their faces unpoliſhed. Luſtre 2. Tranſparency partly 2, partly 1. Hardneſs 9. Sp. gr. 3.081. Colour reddiſh brown. Does not melt at 160° Wedgewood.

SPECIES 13. Felſite †.

57 Felſite.

Compact felſpar.

This ſtone alſo forms a part of many mountains, and is amorphous. Texture ſomewhat foliated. Fracture uneven, approaching to the ſplintery. Luſtre 1. Tranſparency ſcarce 1. Hardneſs 9. Colour azure blue, and ſometimes brown and green. Streak white. Before the blow-pipe, whitens and becomes rifty; but is infuſible *per ſe*.

GENUS VII. SAP.

58 G. VII. SAP. Felſpar.

SPECIES 1. Felſpar ‡.

This ſtone forms the principal part of many of the higheſt mountains. It is commonly cryſtallized. Its primitive form, according to De Liſle, is a rectangular priſm, whoſe baſes are rhombs, with angles of 65° and 115° †. Sometimes the edges of the priſm are wanting, and faces in their place; and ſometimes this is the caſe alſo with the acute angles of the rhomb. For a deſcription and figure of theſe, and other varieties, we refer the reader to *Romé de Liſle*,* *Mr Hauy* †, and *Mr Pini* ‡.

Its texture is foliated. Its croſs fracture uneven. Fragments rhomboidal, and commonly ſmooth and poliſhed on four ſides. Luſtre of the poliſhed faces often 3. Tranſparency from 3 to 1. Hardneſs 9 to 10. Sp. gr. from 2.437 to 2.7. Gives a peculiar odour when rubbed. It is made electric with great difficulty by friction. Fuſible *per ſe* into a more or leſs tranſparent glaſs. When cryſtallized, it decrepitates before the blow-pipe.

Variety 1. Pure Felſpar.

Moon ſtone—Adularia.

This is the pureſt felſpar hitherto found. It occurs in Ceylon and Switzerland; and was firſt mentioned by Mr Sage. Luſtre nearly 3. Tranſparency 2 to 3. Hardneſs 10. Sp. gr. 2.559. Colour white; ſometimes with a ſhade of yellow, green, or red. Its ſurface is ſometimes irideſcent.

Variety 2. Common Felſpar.

Luſtre of the croſs fracture 0; of the fracture, in the direction of the laminæ, from 3 to 1. Tranſparency 2 to 1. Colour moſt commonly fleſh red; but often bluiſh grey, yellowiſh white, milk white, browniſh yellow; and ſometimes blue, olive green, and even black.

Variety 3. Labradore felſpar.

This variety was diſcovered on the coaſt of Labradore by Mr Wolfe; and ſince that time it has been found in Europe. Luſtre 2 to 3. Tranſparency from 1 to 3. Sp. gr. from 2.67 to 2.6925. Colour grey. In certain poſitions, ſpots of it reflect a blue, purple, red, or green colour.

Variety 4. Continuous felſpar.

This variety moſt probably belongs to a different ſpecies; but as it has not hitherto been analyſed, we did not think ourſelves at liberty to alter its place.

It is found in large maſſes. Texture earthy. Fracture uneven, ſometimes ſplintery. Luſtre 0. Tranſparency 1. Hardneſs 10. Sp. gr. 2.609. Colour reddiſh grey, reddiſh yellow, fleſh red.

A ſpecimen of green felſpar from Siberia, analyſed by Vauquelin, contained

62.83 ſilica,
17.02 alumina,
16.00 potaſs,
3.00 lime,
1.00 oxyd of iron.

99.85 ‖.

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* *Hauy, Jour. de Min.* N° xxviii. 267.

† *Frib.* [illegible] 5. *band.* 317.

* *Kirw.* i. 221.

† *Bergbaukunde*, 1 *Band.* p. 92.

‖ *Kirw.* i. 264.

§ *Berg.* iii. 204.

* *Kirw.* i. 325.

† *Kirw.* i. 326.

‡ *Kirw.* i. 316. and *Jour. de Phyſ.* paſſim.

† Fig. 13. and 14.

* *Cryſtall.* ii. 461.

† *Mem. Par.* 1784, p. 273.

‡ *Sur de Nouvelle Cryſtalliſation*, &c. 8.

‖ *Ann. de Chim.* xxx.

59 Lepidolite.

SPECIES 2. Lepidolite (F).

Lilalite.

This ſtone appears to have been firſt obſerved by the Abbé Poda, and to have been firſt deſcribed by De Born[§]. Hitherto it has only been found in Moravia in Germany, and Sudermania in Sweden[*]. There it is mixed with granite in large amorphous maſſes. It is compoſed of thin plates, eaſily ſeparated, and not unlike thoſe of mica[†]. Luſtre, pearly 3. Tranſparency between 1 and 2. Hardneſs 4 to 5. Not eaſily pulveriſed[‡]. Sp. gr. from 2.816[||] to 2.8549[¶]. Colour of the maſs, violet blue; of the thin plates, ſilvery white. Powder white, with a tint of red[§]. Before the blowpipe, it froths, and melts eaſily into a white ſemitranſparent enamel, full of bubbles. Diſſolves in borax with effervescence, and communicates no colour to it[*]. Effervesces ſlightly with ſoda, and melts into a maſs ſpotted with red. With microcoſmic ſalt, it gives a pearl coloured globule[†].

[§] *Crell's Annals*, 1791, ii. 196.
[*] *Beyer, Ann. de Chim.* xxix. 108.
[†] *Le Lievre, Jour. de Min.* N° li. 219.
[‡] *Ibid.*
[||] *Klaproth.*
[¶] *Hauy.*
[§] *Le Lievre, Jour. de Min.* N° li. 219.
[*] *Ibid.*
[†] *Klaproth, Ann. de Chim.* xxii. 37.

This ſtone was firſt called lilalite from its colour, that of the *lily*. Klaproth, who diſcovered its component parts, gave it the name of *lepidolite* (G).

It is compoſed of

53	ſilica,
20	alumina,
18	potaſs,
5	fluat of lime,
3	oxyd of manganeſe,
1	oxyd of iron.
100[‡]	

[‡] *Vauquelin, Ann. de Chim.* xxx. 105.

60 Leucite.

SPECIES 3. Leucite[||].

Veſuvian of Kirwan—*White garnet* of Veſuvius.

[||] *Kirw.* i. 285.

This ſtone is uſually found in volcanic productions, and is very abundant in the neighbourhood of Veſuvius. It is always cryſtallized. The primitive form of its cryſtals is either a cube or a rhomboidal dodecahedron, and its integrant molecules are tetrahedrons; but the varieties hitherto obſerved are all polyhedrons: The moſt common has a ſpheroidal figure, and is bounded by 24 equal and ſimilar trapeziods[†]; ſometimes the faces are 12, 18, 36, 54, and triangular, pentagonal, &c. For a deſcription and figure of ſeveral of theſe, we refer the reader to Mr Hauy[||]. The cryſtals vary from the ſize of a pin head to that of an inch.

[†] Fig. 15.
[||] *Jour. de Min.* N° xxvii. 185.

The texture of the leucite is foliated. Its fracture ſomewhat conchoidal. Luſtre 3; when in a ſtate of decompoſition 0. Tranſparency 3 to 2; when decompoſing 0. Hardneſs 8 to 10; when decompoſing 5 to 6. Sp. gr. 2.4648. Colour white, or greyiſh white (H). Its powder cauſes ſyrup of violets to aſſume a green colour[*].

[*] *Vauquelin, Jour. de Min.* N° xxxix. 165.

It is compoſed, as Klaproth has ſhewn, of

54	ſilica,
23	alumina,
22	potaſs.
99 (I)	

It was by analyſing this ſtone that Klaproth diſcovered the preſence of potaſs in the mineral kingdom; which is not the leaſt important of the numerous diſcoveries of that accurate and illuſtrious chemiſt.

Leucite is found ſometimes in rocks which have never been expoſed to volcanic fire; and Mr Dolomieu has rendered it probable, from the ſubſtances in which it is found, that the leucite of volcanoes has not been formed by volcanic fire, but that it exiſted previouſly in the rocks upon which the volcanoes have acted, and that it was thrown out unaltered in fragments of theſe rocks[§].

[§] *Jour. de Min.* N° xxxix. 177.

61 G. VIII. SAG. Emerald.

GENUS VIII. SAG.

SPECIES 1. Emerald (K).

This ſtone has hitherto been only found cryſtallized. The primitive form of its cryſtals is a regular ſix-ſided priſm; and the form of its integrant molecules is a triangular priſm, whoſe ſides are ſquares, and baſes equilateral triangles[*]. The moſt common variety of its cryſtals is the regular ſix-ſided priſm, ſometimes with the edges of the priſm, or of the baſes, or the ſolid angles, or both wanting[‡], and ſmall faces in their place[†]. The ſides of the priſm are generally channelled.

[*] *Hauy, Jour. de Min.* N° xix. 72.
[‡] Fig. 16.
[†] *Romé de Liſle*, ii. 245. and *Hauy, ibid.*

Its texture is foliated. Its fracture conchoidal. Luſtre uſually from 3 to 4. Tranſparency from 2 to 4. Cauſes a double refraction. Hardneſs 12. Sp. gr. 2.65 to 2.775. Colour green. Becomes electric by friction, but not by heat. Its powder does not phoſphoreſce when thrown on a hot iron[†]. At 150° Wedgewood it melts into an opaque coloured maſs. According to Dolomieu, it is fuſible *per ſe* by the blow-pipe[‡].

[†] *Dolomieu, Jour. de Min.* N° xviii. 19.
[‡] *Ibid.*

This mineral was formerly ſubdivided into two diſtinct ſpecies, the *emerald*, and *beryl* or *aqua marina*. Hauy demonſtrated, that the emerald and beryl correſponded exactly in their ſtructure and properties, and Vauquelin found that they were compoſed of the ſame ingredients; henceforth, therefore, they muſt be conſidered as varieties of the ſame ſpecies.

The variety formerly called *emerald* varies in colour from the pale to the perfect green. When heated to 120° Wedgewood, it becomes *blue*, but recovers its colour when cold. A ſpecimen, analyſed by Vauquelin, was compoſed of

64.60	ſilica,
14.00	alumina,
13.00	glucina,
3.50	oxyd of chromum,
2.56	lime,
2.00	moiſture or other volatile ingredient.
99.66[||]	

[||] *Ann. de Chim.* xxvi. 264.

The *beryl* is of a greyiſh green colour, and ſometimes blue, yellow, and even white: ſometimes different colours appear in the ſame ſtone[§]. It is found in Ceylon, different parts of India, Brazil, and eſpecially in Siberia and Tartary, where its cryſtals are ſometimes a foot long[¶].

[§] *Dolomieu, ibid.*
[¶] *Ibid.*

(F) *Kirw.* I. 208.—*Karſten. Beob. der Berlin*, 5 *Band.* 71.—*Klaproth Beiträge*, I. 279. and II. 191.

(G) That is, *ſcale ſtone*, or ſtone compoſed of ſcales: From λεπις,, *the ſcale of a fiſh*, and λιθος, *a ſtone.*

(H) Hence the name leucite, from λευκος, *white.*

(I) See *Jour. de Min.* N° XXVII. 194. and 201. and *Klaproth's Beiträge*, II. 39.

(K) *Kir.* I. 247. and 248.—*Dolomieu. Magazin Encyclopædique*, II. 17. and 145.; and *Jour. de Min.* N° XVIII. 19.—*Klaproth Beiträge*, II. 12.

Earths and Stones.

long. A ſpecimen of beryl, analyſed by Vauquelin, contained
69 ſilica,
13 alumina,
16 glucina,
1.5 oxyd of iron.

99.5||

It was by analyſing this ſtone that Vauquelin diſcovered the earth which he called *glucina*.

|| xxviii. 168.

62 G. IX. SAB. …rolite. * K… i. 282.

GENUS IX. SAB.

SPECIES 1. Staurolite*.

Andreolite of Lametherie and Hauy—*Hyacinthe blanche cruciforme*, var. 9. of Romé de Liſle.

This ſtone has been found at Andreaſberg in the Hartz. It is cryſtallized, and the form of its cryſtals has induced mineralogiſts to give it the name of *croſs-ſtone*. Its cryſtals† are two four-ſided flattened priſms, terminated by four ſided pyramids, interſecting each other at right angles: the plane of interſection paſſing longitudinally through the priſms (L).

† Fig. 17.

Its texture is foliated. Its luſtre waxy, 2. Tranſparency from 1 to 3. Hardneſs 9. Brittle. Sp. gr. 2.355 to 2.361. Colour milk white. When heated ſlowly, it loſes 0.15 or 0.16 parts of its weight, and falls into powder. It effervesces with borax and microcoſmic ſalt, and is reduced to a greeniſh opaque maſs. With ſoda it melts into a frothy white enamel. When its powder is thrown on a hot coal, it emits a greeniſh yellow light†.

† Hauy, … N° xxviii. 280.

A ſpecimen analyſed by Weſtrum was compoſed of
44 ſilica,
20 alumina,
20 barytes,
16 water.

100

Klaproth found the ſame ingredients, and nearly in the ſame proportions‡.

‡ Beiträge, …

A variety of ſtaurolite has been found only once, which has the following peculiarities.

Its luſtre is pearly, 2. Sp. gr. 2.361. Colour browniſh grey. With ſoda it melts into a purpliſh and yellowiſh frothy enamel. It is compoſed, according to Weſtrum, of
47.5 ſilica,
12.0 alumina,
20.0 barytes,
16.0 water,
4.5 oxyds of iron and manganeſe.

100.0

… X. ASL. …ryſobe… … Kirw. i. …

GENUS X. 1. ASL.

SPECIES 1. Chryſoberyl*.

Oriental chryſolite of jewellers—*Cymophane* of Hauy.

Hitherto this ſtone has been found only in Brazil, the iſland of Ceylon, and as ſome affirm near Nortſchink in Siberia. Werner firſt made it a diſtinct ſpecies, and gave it the name which we have adopted. It is uſually found in round maſſes about the ſize of a pea, but it is ſometimes alſo cryſtallized. The primitive form of its cryſtals is a four-ſided rectangular priſm, whoſe height is to its breadth as $\sqrt{3}$ to 1, and to its thickneſs as $\sqrt{2}$ to 1†. The only variety hitherto obſerved is an eight-ſided priſm, terminated by ſix-ſided ſummits‡. Two of the faces of the priſm are hexagons, two are rectangles, and four trapeziums; two faces of the ſummits are rectangles, and the other four trapeziums. Sometimes two of the edges of the priſm are wanting, and ſmall faces in their place†.

Simple Stones.

† Fig. 18.

‡ Fig. 19.

† Hauy, Jour. de Min. N° xxi. 5.

Its texture is foliated. Laminæ parallel to the faces of the priſm. Luſtre 3 to 4. Tranſparency 3 to 4. Cauſes ſingle refraction. Hardneſs 12. Sp. gr. from 3.698‡ to 3.7961||. Colour yellowiſh green, ſurface ſparkling. It is infuſible by the blow-pipe *per ſe*, and with ſoda.

‡ Werner.

|| Hauy.

A ſpecimen of chryſoberyl, analyſed by Klaproth, was compoſed of
71.5 alumina,
18.0 ſilica,
6.0 lime,
1.5 oxyd of iron.

97.0§

§ Beiträge, i. 102.

64 G. X. 2. SAL. Hyalite.

GENUS X. 2. SAL.

SPECIES 2. Hyalite*.

* Kirw. i. 296.

This ſtone is frequently found in trap. It occurs in grains, filaments, and rhomboidal maſſes. Texture foliated. Fracture uneven, inclining to conchoidal. Luſtre glaſſy (M), 2 to 3. Tranſparency 2 to 3; ſometimes, tho' ſeldom, it is opaque. Hardneſs 9. Sp. gr. 2.11†. Colour pure white. Infuſible at 150° Wedgewood; but it yields to ſoda‡. According to Mr Link, it is compoſed of
57 ſilica,
18 alumina,
15 lime.

90 and a very little iron||.

† Kirwan.

‡ Id.

|| Crell's Annals, 1790, 2 Band. 232.

65 Ædelite.

Species 3. Ædelite*.

* Kirw. i. 276.

This ſtone has hitherto been found only in Sweden at Moſſeberg and Ædelfors. From this laſt place Mr Kirwan, who firſt made it a diſtinct ſpecies, has given it the name which we have adopted. It was firſt mentioned by Bergman†. Its form is tuberoſe and knotty. Texture ſtriated; ſometimes reſembles quartz. Luſtre from 0 to 1. Sp. gr. 2.515 after it has abſorbed water‡. Colour light grey, often tinged red; alſo yellowiſh brown, yellowiſh green and green. Before the blow-pipe it intumeſces and forms a frothy maſs. Acids convert it into a jelly§. A ſpecimen from Moſſeberg, analyſed by Bergman, contained
69 ſilica,
20 alumina,
8 lime,
3 water.

100||

† Opuſc. vi. 101.

‡ See Kirwan's Min. i. 276.

§ Berg. iii. 227.

A ſpecimen from Ædelfors yielded to the ſame chemiſt
62 ſilica,
18 alumina,
16 lime,
4 water.

100¶

|| Opuſc. vi. 101.

¶ Ibid.

GENUS

(L) See *Gillet*, *Jour. de Phyſ.* 1793, p. 1 and 2.

(M) Hence probably the name *hyalite*, which was impoſed by Werner from ὑαλος, *glaſs*, and λιθος, *a ſtone*.

66
G. X. 3.
SAWL.
Zeolite.

GENUS X. 3. SAWL.

SPECIES 4. Zeolite (N).

This ſtone was firſt deſcribed by Cronſtedt in the Stockholm Tranſactions for 1756. It is found ſometimes amorphous and ſometimes cryſtallized. The primitive form of its cryſtals is a rectangular priſm, whoſe baſes are ſquares. The moſt common variety is a long four-ſided priſm, terminated by low four ſided pyramids.*

* Hauy, Jour. de Min. N° xiv. 86.

Its texture is ſtriated or fibrous. Its luſtre is ſilky, from 3 to 1. Transparency from 2 to 4; ſometimes 1. Hardneſs 6 to 8; ſometimes only 4. Abſorbs water. Sp. gr. 2.07 to 2.3. Colour white, often with a ſhade of red or yellow; ſometimes brick-red, green, blue. When heated, it becomes electric like the tourmaline.† Before the blow-pipe it froths (O), emits a phoſphoreſcent light, and melts into a white ſemitranſparent enamel, too ſoft to cut glaſs, and ſoluble in acids. In acids it diſſolves ſlowly and partially without effervescence; and at laſt, unleſs the quantity of liquid be too great, it is converted into a jelly.

† Hauy, ibid. N° xxviii. 276.

A ſpecimen of zeolite (P), analyſed by Vauquelin, contained

53.00	ſilica,
27.00	alumina,
9.46	lime,
10.00	water.
99.46 ‡.	

‡ Ibid. N° xliv. 576.

67
Stilbite.

SPECIES 5. Stilbite.

This ſtone was firſt formed into a diſtinct ſpecies by Mr Hauy. Formerly it was conſidered as a variety of zeolite.

The primitive form of its cryſtals is a rectangular priſm, whoſe baſes are rectangles. It cryſtallizes ſometimes in dodecahedrons, conſiſting of a four-ſided priſm with hexagonal faces, terminated by four-ſided ſummits, whoſe faces are oblique parallelograms; ſometimes in ſix-ſided priſms, two of whoſe ſolid angles are wanting, and a ſmall triangular face in their place.*

* Hauy, Jour. de Min. N° xiv. 86.

Its texture is foliated. The laminæ are eaſily ſeparated from each other; and are ſomewhat flexible. Luſtre pearly, 2 or 3 (Q). Hardneſs inferior to that of zeolite, which ſcratches ſtilbite. Brittle. Sp. gr. 2.500.† Colour pearl white. Powder bright white, ſometimes with a ſhade of red. This powder, when expoſed to the air, cakes and adheres as if it had abſorbed water. It cauſes ſyrup of violets to aſſume a green colour. When ſtilbite is heated in a porcelain crucible, it ſwells up and aſſumes the colour and ſemitranſparency of baked porcelain. By this proceſs it loſes 0.185 of its weight. Before the blow-pipe it froths like borax, and then melts into an opaque white coloured enamel.§

† Hauy, ibid. N° xxviii. 276.

§ Vauquelin, ibid. N° xxxix. 161.

According to the analyſis of Vauquelin, it is compoſed of

52.0	ſilica,
17.5	alumina,
9.0	lime,
18.5	water.
97.0 ‖	

‖ Ibid. 164.

68
Analcime.

SPECIES 6. Analcime.

This ſtone, which was diſcovered by Mr Dolomieu, is found cryſtallized in the cavities of lava. It was firſt made a diſtinct ſpecies by Mr Hauy. Mineralogiſts had formerly confounded it with zeolite.

The primitive form of its cryſtals is a cube. It is ſometimes found cryſtallized in cubes, whoſe ſolid angles are wanting, and three ſmall triangular faces in place of each; ſometimes in polyhedrons with 24 faces. It is uſually ſomewhat tranſparent. Hardneſs about 8; ſcratches glaſs ſlightly. Sp. gr. above 2. When rubbed, it acquires only a ſmall degree of electricity, and with difficulty (R). Before the blow-pipe it melts without frothing, into a white ſemitranſparent glaſs.*

* Hauy, Jour. de Min. N° xiv. 86. and xxviii. 278.

69
G. X. 4.
SLA. Lazulite.

GENUS X. 4. SLA.

SPECIES 7. Lazulite.†

This ſtone, which is found chiefly in the northern parts of Aſia, has been long known to mineralogiſts by the name of *lapis lazuli.* This term has been contracted into *lazulite* by Mr Hauy; an alteration which was certainly proper, and which therefore we have adopted.

† Kirw. i. 283.

Lazulite is always amorphous. Its texture is earthy. Its fracture uneven. Luſtre 0. Opaque, or nearly ſo. Hardneſs 8 to 9. Sp. gr. 2.76 to 2.945 ‡. Colour blue (S); often ſpotted white from ſpecks of quartz, and yellow from particles of pyrites.

‡ Briſſon.

It retains its colour at 100° Wedgewood; in a higher heat it intumeſces, and melts into a yellowiſh black maſs. With acids it efferveſces a little, and if previouſly calcined, forms with them a jelly.

Margraff publiſhed an analyſis of lazulite in the Berlin Memoirs for 1758. His analyſis has ſince been confirmed by Klaproth, who found a ſpecimen of it to contain

46.0	ſilica,
14.5	alumina,
28.0	carbonat of lime,
6.5	ſulphat of lime,
3.0	oxyd of iron,
2.0	water.
100.0 §	

§ Beitrâge, i. 196.

70
G. XI.
SALI. Garnet.

GENUS XI. SALI.

SPECIES 1. Garnet (T).

This ſtone is found abundantly in many mountains. It is uſually cryſtallized. The primitive form of its chryſtals

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(N) *Kirw.* I. 278.—*Guettard,* IV. 637.—*Bucquet, Mem. Sav. Etrang.* IX. 576.—*Pelletier, Jour. de Phyſ.* XX. 420.

(O) Hence the name *zeolite,* given to this mineral by Cronſtedt; from ζεω, *to ferment,* and λιθος, *a ſtone.*

(P) Dr Black was accuſtomed to mention, in the courſe of his lectures, that Dr Hutton had diſcovered *ſoda* in zeolite. This diſcovery has not hitherto been verified by any other chemical mineralogiſt.

(Q) Hence the name given to this mineral by Hauy, *ſtilbite,* from στιλβω, to *ſhine.*

(R) Hence the name *analcime* given it by Hauy, from αναλκις, *weak.*

(S) Hence the name *lazulite,* from an Arabian word *azul,* which ſignifies *blue.*

(T) *Kirw.* I. 258.—*Gerhard, Diſquiſitio phyſico-chymica Granatorum,* &c.—*Paſumot, Jour. de Phyſ.* III. 442.—*Wiegleb, Ann. de Chim.* I. 231.

cryſtals is a dodecahedron whoſe ſides are rhombs, with angles of 78° 31′ 44″, and 120° 28′ 16″. The inclination of the rhombs to each other is 120°. This dodecahedron may be conſidered as a four-ſided priſm, terminated by four-ſided pyramids.* It is diviſible into four parallelopipeds, whoſe ſides are rhombs; and each of theſe may be divided into four tetrahedrons, whoſe ſides are iſoſceles triangles, equal and ſimilar to either of the halves into which the rhomboidal faces of the dodecahedron are divided by their ſhorter diagonal. The integrant molecules of garnet are ſimilar tetrahedrons.† Sometimes the edges of the dodecahedron are wanting, and ſmall faces in their place; and ſometimes garnet is cryſtallized in polyhedrons, having 24 trapezoidal faces. For a deſcription and figure of theſe, and other varieties of garnet, we refer to *Romé de Liſle* and *Hauy*.‡

* Fig. 20.
* De Liſle, ii. 322 and Hauy, Ann. de Chim. xvii. 305.
† Hauy, ibid. 306.
‡ Ibid.

The texture of garnet, as Bergman firſt ſhewed, is foliated.‖ Its fracture commonly conchoidal. Internal luſtre from 4 to 2. Tranſparency from 2 to 4; ſometimes only 1 or 0. Cauſes ſingle refraction.§ Hardneſs from 10 to 14. Sp. gr. 3.75 to 4.188. Colour uſually red. Often attracted by the magnet. Fuſible *per ſe* by the blow-pipe.

‖ Opuſc. ii. 9.
§ Hauy, Jour. de Min. N° xxviii. 260.

Variety 1. Oriental garnet (v).

Internal luſtre 3 to 4. Tranſparency 4. Hardneſs 13 to 14. Sp. gr. 4 to 4.188. Colour deep red, inclining to violet (x).

Variety 2. Common garnet.

Fracture uneven, inclining to the conchoidal. Internal luſtre 2 to 3. Tranſparency from 3 to 0. Hardneſs 10 to 11; ſometimes only 9. Sp. gr. 3.75 to 4. Colour commonly deep red, inclining to violet; ſometimes verging towards black or olive; ſometimes leek green, brown, yellow.

Variety 3. Amorphous garnet.

Structure ſlaty. Luſtre 2. Tranſparency 2 to 1. Hardneſs 11 to 12. Sp. gr. 3.89. Colour browniſh or blackiſh red. Found in Sweden, Switzerland, and the Eaſt Indies.

A ſpecimen of oriental garnet, analyſed by Klaproth, contained
35.75 ſilica,
27.25 alumina,
36.00 oxyd of iron,
0.25 oxyd of mangane ſe.

99.25 *

* Beitrage, ii. 26.

A ſpecimen of red garnet, analyſed by Vauquelin, contained
52.0 ſilica,
20.0 alumina,
17.0 oxyd of iron,
7.7 lime.

96.7 †

† Jour. de Min. N° xxx. 375.

A ſpecimen of black garnet yielded to the ſame chemiſt
43 ſilica,
16 alumina,
20 lime,
16 oxyd of iron,
4 moiſture.

99 ‡.

‡ Ibid. 375.

Mr Klaproth found a ſpecimen of Bohemian garnet, compoſed of
40.00 ſilica,
28.50 alumina,
16.50 oxyd of iron,
10.00 magneſia,
3.50 lime,
.25 oxyd of mangane ſe.

98.75 ¶

¶ Beiträge, ii. 21.

SPECIES 2. Thumerſtone.*

71 Thumerſtone.

Yanolite of Lametherie—*Axinite* of Hauy.

This ſtone was firſt deſcribed by Mr Schreber, who found it near Balme d'Auris in Dauphiné, and gave it the name of *ſhorl violet*.† It was afterwards found near Thum in Saxony, in conſequence of which Werner called it *thumerſtone*.

* Kirw. i. 273—Pelletier, Jour. de Phyſ. xxvi. 66.
† De Liſle, ii. 353.

It is ſometimes amorphous; but more commonly cryſtallized. The primitive form of its cryſtals is a rectangular priſm, whoſe baſes are parallelograms with angles of 101° 32′ and 78° 28′.‡ The moſt uſual variety is a flat rhomboidal parallelopiped, with two of its oppoſite edges wanting, and a ſmall face in place of each.§ The faces of the parallelopiped are generally ſtreaked longitudinally.

‡ Hauy, Jour. de Min. N° xxviii. 264.
§ Fig. 21.
§ De Liſle, ibid.

The texture of thumerſtone is foliated. Its fracture conchoidal. Luſtre 2. Tranſparency, when cryſtallized, 3 to 4; when amorphous, 2 to 1. Cauſes ſimple refraction ‖ Hardneſs 10 to 9. Sp. gr. 3.2956. Colour clove brown; ſometimes inclining to red, green, grey, violet, or black. Before the blow-pipe it froths like zeolite, and melts into a hard black enamel. With borax it exhibits the ſame phenomena, or even when the ſtone is ſimply heated at the end of a pincer.¶

‖ Hauy, ibid.
¶ Vauquelin, Jour. de Min. N° xxiii. 1.

A ſpecimen of thumerſtone, analyſed by Klaproth, contained
52.7 ſilica,
25.6 alumina,
9.4 lime,
9.6 oxyd of iron with a trace of mangane ſe.

97.3 *

* Beiträge, ii. 126.

A ſpecimen, analyſed by Vauquelin, contained
44 ſilica,
18 alumina,
19 lime,
14 oxyd of iron,
4 oxyd of mangane ſe.

99 †

† Jour. de Min. ibid.

SPECIES 3. Prehnite (y).

72 Prehnite.

Though this ſtone had been mentioned by Sage,† Romé de Liſle,* and other mineralogiſts, Werner was the firſt who properly diſtinguiſhed it from other minerals, and made it a diſtinct ſpecies. The ſpecimen which he examined was brought from the Cape of Good Hope by Colonel Prehn; hence the name *prehnite*, by which he diſtinguiſhed it. It was found near Dumbarton by Mr Grotche†; and ſince that time it has been obſerved in other parts of Scotland.

† Miner. i. 232.
* Cryſtallog. ii. 275.
† Ann. de Chim i. 213.

(v) This ſeems to be the *carbuncle* (ἄνθραξ) of Theophraſtus, and the *carbunculus garamanticus* of other ancient writers. See *Hill's Theophraſtus* περὶ λίθων, p. 74 and 77.

(x) Hence, according to many, the name *garnet* (in Latin *granatus*), from the reſemblance of the ſtone in colour to the bloſſom of the pomegranate.

(y) *Kirw.* I. 274.—*Haſſenfratz*, *Jour. de Phyſ.* XXXII. 81.—*Sage*, *ibid.* XXXIV. 446.—*Klaproth*, *Beob. der Berlin*, 2 *Band.* 211. And *Ann. de Chim.* I. 201.

It is both amorphous and cryſtallized. The cryſtals are in groups, and confuſed: they ſeem to be four-ſided priſms with dihedral ſummits ‡. Sometimes they are irregular ſix-ſided plates, and ſometimes flat rhomboidal parallelopipeds.

‡ *Hauy, Jour. de Min.* N° xxviii. 277.

Its texture is foliated. Fracture uneven. Internal luſtre pearly, ſcarcely 2. Tranſparency 3 to 2. Hardneſs 9 to 10. Brittle. Sp. gr. 2.6969 ‖. Colour apple green, or greeniſh grey. Before the blow-pipe it froths more violently than zeolite, and melts into a brown enamel. A ſpecimen of prehnite, analyſed by Klaproth, was compoſed of

‖ *Hauy, ibid.*

43.83	ſilica,
30.33	alumina,
18.33	lime,
5.66	oxyd of iron,
1.16	air and water.
99.31 §	

§ *Ann. de Chim.* i. 208.

Whereas Mr Haſſenfratz found in another ſpecimen

50.0	ſilica,
20.4	alumina,
23.3	lime,
4.9	iron,
.9	water,
.5	magneſia.
100.0 ¶	

¶ *Ibid.* and *Jour. de Phyſ.* N° xxxii. 81.

SPECIES 4. Thallite.

73 Thallite.

Green ſhorl of Dauphiné of De Liſle *—*Delphinite* of Sauſſure.

* *Cryſtallog.* ii. 401.

This ſtone is found in the fiſſures of mountains; and hitherto only in Dauphiné and on Chamouni in the Alps.

It is ſometimes amorphous, and ſometimes cryſtallized. The primitive form of its cryſtals is a rectangular priſm, whoſe baſes are rhombs with angles of 114° 37′, and 65° 23′ †. The moſt uſual variety is an elongated four-ſided priſm (often flattened), terminated by four-ſided incomplete pyramids §; ſometimes it occurs in regular ſix-ſided priſms ‡. The cryſtals are often very ſlender.

† *Hauy, Jour. de Min.* N° xxviii. 271.
§ Fig. 22.
‡ *Romé de Liſle, ibid.* and *Hauy, Jour. de Min.* N° xxx. 415.

Its texture appears fibrous. Luſtre inconſiderable. Tranſparency 2 to 3, ſometimes 4; ſometimes nearly opaque. Cauſes ſingle refraction. Hardneſs 9 to 10. Brittle. Sp. gr. 3.4529 to 3.46. Colour dark green (z). Powder white or yellowiſh green, and feels dry. It does not become electric by heat. Before the blow-pipe, froths and melts into a black ſlag. With borax melts into a green bead ‖.

‖ *Hauy*, and *Deſcotils, ibid.*

A ſpecimen of thallite, analyſed by Mr Deſcotils, contained

37	ſilica,
27	alumina,
17	oxyd of iron,
14	lime,
1.5	oxyd of mangneſe.
96.5 §	

§ *Ibid.* N° xxx. 420.

GENUS XII. I. AMS.

SPECIES I. Cyanite.*

Sappare of Sauſſure.

74 G. XII. AMS. Cyanite.

* *Kirw.* i. 209.—*Sage, Jour. de Phyſ.* xxxv. 39.

This ſtone was firſt deſcribed by Mr Sauſſure, the ſon, who gave it the name of *Sappare* †. It is commonly found in granite rocks. The primitive form of its cryſtals is a fourſided oblique priſm, whoſe ſides are inclined at an angle of 103°. The baſe forms with one ſide of the priſm an angle of 103°; with another, an angle of 77°. It is ſometimes cryſtallized in ſix-ſided priſms ‡.

† *Jour. de Phyſ.* xxxiv. 213.
‡ *Hauy, Jour. de Min.* N° xxviii. 282.

Its texture is foliated. Laminæ long. Fragments long, ſplintery. Luſtre pearly, 2 to 3. Tranſparency of the laminæ 3. Cauſes ſingle refraction ‖. Hardneſs 6 to 9. Brittle. Sp. gr. from 3.092 to 3.622 §. Feels ſomewhat greaſy. Colour milk white, with ſhades of ſky or pruſſian blue (A); ſometimes bluiſh grey; ſometimes partly bluiſh grey, partly yellowiſh or greeniſh grey.

‖ *Hauy, ibid.*
§ *Kirwan.*

Before the blow pipe it becomes almoſt perfectly white; but does not melt. According to the analyſis of Sauſſure, it is compoſed of

66.92	alumina,
13.25	magneſia,
12.81	ſilica,
5.48	iron,
1.71	lime.
100.17 ¶	

¶ *Jour. de Phyſ. ibid.*

Cyanite has alſo been analyſed by Struvius and Hermann, who agree with Sauſſure as to the ingredients; but differ widely from him and one another as to the proportions.

Struvius.		Hermann.
5.5	- - -	30 alumina
30.5	- - -	39 magneſia,
51.5	- - -	23 ſilica,
5.0	- - -	2 iron,
4.0	- - -	3 lime.
96.5 *		97 †

* *Crell's Annals*, 1790.
† *Ibid.*

GENUS XII. 2. MSA.

SPECIES 2. Serpentine (B).

75 G. XII. 2. MSA Serpentine.

This ſtone is found in amorphous maſſes. Its fracture is ſplintery. Luſtre 0. Opaque. Hardneſs 6 to 7. Sp. gr. 2.2645 to 2.709. Feels rather ſoft, almoſt greaſy. Generally emits an earthy ſmell when breathed upon. Its colours are various ſhades of green, yellow, red, grey, brown, blue: commonly one or two colours form the ground, and one or more appear in ſpots or veins (c).

Before the blow-pipe it hardens and does not melt.

A ſpecimen of ſerpentine, analyſed by Mr Chenevix, contained

34.5	magneſia,
28.0	ſilica,
23.0	alumina,
4.5	oxyd of iron,
0.5	lime,
10.5	water.
101.0*	

* *Ann. de Chim.* xxviii 199.

GENUS

(z) Hence the name *thallite* given it by Lametherie, from θαλλος, *a green leaf.*

(A) Hence the name *cyanite*, impoſed by Werner.

(B) *Kirw.* I. 156.—*Margraf, Mem. Berlin*, 1759, p. 3.—*Bayen, Jour. de Phyſ.* XIII. 46.—*Mayer, Crell's Annals*, 1789, II. 416.

(c) Hence the name *ſerpentine*, given to the ſtone from a ſuppoſed reſemblance in colours to the ſkin of a ſerpent.

76
G. XIII.
MSAI.
Potſtone.
† Kirw. i. 155.

Genus XIII. MSAI.

SPECIES 1. Potſtone †.

This ſtone is found in neſts and beds, and is always amorphous. Its ſtructure is often ſlaty. Texture undulatingly foliated. Luſtre from 1 to 3. Tranſparency from 1 to 0; ſometimes 2. Hardneſs 4 to 6. Brittle. Sp. gr. from 2.8531 to 3.023. Feels greaſy. Sometimes abſorbs water. Colour grey with a ſhade of green, and ſometimes of red or yellow; ſometimes leek green; ſometimes ſpeckled with red.

Potſtone is not much affected by fire; and has therefore been made into utenſils for boiling water; hence its name.

According to Wiegleb, the potſtone of Como contains
38 magneſia,
38 ſilica,
7 alumina,
5 iron,
1 carbonat of lime,
1 fluoric acid.
90

77
Chlorite.
* Kirw. i. 147.

SPECIES 2. Chlorite.*

This mineral enters as an ingredient into different mountains. It is ſometimes amorphous, and ſometimes cryſtallized in oblong, four-ſided, acuminated cryſtals.

Its texture is foliated. Its luſtre from 0 to 2. Opaque. Hardneſs from 4 to 6; ſometimes in looſe ſcales. Colour green.

Variety 1. Farinaceous chlorite.

Compoſed of ſcales ſcarcely cohering, either heaped together, or inveſting other ſtones. Feels greaſy. Gives an earthy ſmell when breathed on. Difficult to pulveriſe. Colour graſs green, ſometimes greeniſh brown; ſometimes dark green, inclining to black. Streak white. When the powder of chlorite is expoſed to the blow-pipe it becomes brown. Before the blow-pipe, farinaceous chlorite froths and melts into a dark brown glaſs; with borax it forms a greeniſh brown glaſs*.

Variety 2. Indurated chlorite.

This variety is cryſtallized. Luſtre 1. Hardneſs 6. Feel meagre. Colour dark green, almoſt black. Streak mountain green.

Variety 3. Slaty chlorite.

Structure ſlaty. Fragments flatted. Internal luſtre 1 to 2. Hardneſs 5. Colour greeniſh grey, or dark green inclining to black. Streak mountain green.

A ſpecimen of the firſt variety, analyſed by Vauquelin, contained
43.3 oxyd of iron,
26.0 ſilica,
15.5 alumina,
8.0 magneſia,
2.0 muriat of potaſs,
4.0 water.
98.8†

* *Vauquelin. Jour. de Min.* N° xxxii. 167.

† *Ann. de Chim.* xxx. 166.

A ſpecimen of the ſame variety yielded Mr Hœpner
12.92 oxyd of iron,
37.50 ſilica,
4.17 alumina,
43.75 magneſia,
1.66 lime.
100.0 ‡

A ſpecimen of the ſecond variety, analyſed by the ſame chemiſt, contained
10.15 oxyd of iron,
41.15 ſilica,
6.13 alumina,
39.47 magneſia,
1.50 lime,
1.50 air and water.
99.9 §

‡ *Sauſſure's Voyages*, ii. 133.

§ *Crell's Annals*, 1790, p. 56.

On the ſuppoſition that theſe analyſes are accurate, the enormous difference between them is a demonſtration that chlorite is not a chemical combination, but a mechanical mixture.

78
G. XIV.
SLAM.
Siliceous ſpar.

Genus XIV. SLAM.

SPECIES 8. Siliceous ſpar (D).

This ſtone has been found in Tranſylvania. It is cryſtallized in 4 or 6 ſided priſms, channelled tranſverſely, and generally heaped together. Its texture is fibrous. Its luſtre ſilky, 2. Its colours white, yellow, green, light blue. According to Bindheim, it contains
61.1 ſilica,
21.7 lime,
6.6 alumina,
5.0 magneſia,
1.3 oxyd of iron,
3.3 water.
99.0*

* *Berg.* vi. 104.

79
G. XV.
SAMLI.
Argillite.
† *Kirw.* i. 234.

Genus XV. SAMLI.

SPECIES 1. Argillite †.

Argillaceous ſkiſtus—Common ſlate.

This ſtone conſtitutes a part of many mountains.

Its ſtructure is ſlaty. Its texture foliated. Fracture ſplintery. Fragments often tabular. Luſtre moſt commonly ſilky, 2; ſometimes 0. Tranſparency from 0 to 1. Hardneſs from 5 to 8. Sp. gr. from 2 67 to 2.88. Does not adhere to the tongue. Gives a clear ſound when ſtruck. Often imbibes water. Streak white or grey. Colour moſt commonly grey, with a ſhade of blue, green, or black; ſometimes purpliſh, yellowiſh, mountain green, brown, bluiſh black; ſometimes ſtriped or ſpotted with a darker colour than the ground.

It is compoſed, according to Kirwan, of ſilica, alumina, magneſia, lime, oxyd of iron. In ſome varieties the

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(D) Is this the *tremolite* of Lowitz from the lake Baikal in Siberia? If ſo, the name of the genus ought to be SLM; for he found it to contain no alumina. According to his analyſis, it was compoſed of
52 ſilica,
20 lime,
12 carbonat of lime,
12 magneſia,
96

Earths and Stones.

the lime is wanting. Several varieties contain a conſiderable quantity of carbonaceous matter.

80
G. XVI.
SLACMI.
Smaragdite.

GENUS XVI. SLACMI.

SPECIES 1. Smaragdite.

This ſtone was called *ſmaragdite* by Mr Sauſſure, from ſome reſemblance which it has to the emerald. Its texture is foliated. The laminæ are inflexible. Fracture even. Hardneſs 7. Colour in ſome caſes fine green, in others it has the grey colour and metallic luſtre of mica: it aſſumes all the ſhades of colour between theſe two extremes.†

† *Hauy, Jour. de Min.* N° xxviii. 272.

According to the analyſis of Vauquelin, it is compoſed of

50.0	ſilica,
13.0	lime,
11.0	alumina,
7.5	oxyd of chromum,
6.0	magneſia,
5.5	oxyd of iron,
1.5	oxyd of copper.
94.5 ‡	

‡ *Ann. de Chim.* xxx. 106.

81
G. XVII.
SM.
Kiffekil.

GENUS XVII. SM.

SPECIES 1. Kiffekil.*

Myrſen—Seafroth.

* *Kirwan's Min.* i. 144.

This mineral is dug up near Konie in Natolia, and is employed in forming the bowls of Turkiſh tobacco pipes. The ſale of it ſupports a large monaſtery of dervifes eſtabliſhed near the place where it is dug. It is found in a large fiſſure ſix feet wide, in grey calcareous earth. The workmen aſſert, that it grows again in the fiſſure,† and puffs itſelf up like froth (E). This mineral, when freſh dug, is of the conſiſtence of wax; it feels ſoft and greaſy; its colour is yellow; its ſp. gr. 1,600‡: when thrown on the fire it ſweats, emits a fetid vapour, becomes hard, and perfectly white.

† *Reignegg. Philoſ. Mag.* iii. 165.
‡ *Klaproth.*

According to the analyſis of Klaproth, it is compoſed of

50.50	ſilica,
17.25	magneſia,
25.00	water,
5.00	carbonic acid,
.50	lime.
98.25 §	

§ *Beiträge,* ii. 172.

82
Steatites.

SPECIES 2. Steatites (F).

Though this mineral was noticed by the ancients, little attention was paid to it by mineralogiſts, till Mr Pott publiſhed his experiments on it in the Berlin Memoirs for 1747.

It is uſually amorphous, but ſometimes it is cryſtallized in ſix-ſided priſms. Its texture is commonly earthy, but ſometimes foliated. Luſtre from 0 to 2. Tranſparency from 0 to 2. Hardneſs 4 to 7. Sp. gr. from 2.61 to 2.794.* Feels greaſy. Seldom adheres to the tongue. Colour uſually white or grey; often with a tint of other colours; the foliated commonly green. Does not melt *per ſe* before the blow-pipe.

* *Briſſon.*

Simple Stones.

Variety I. Semi-indurated ſteatites.

Texture earthy. Fracture ſometimes coarſe ſplintery. Luſtre 0. Tranſparency 0, or ſcarce 1. Hardneſs 4 to 5. Abſorbs water. Takes a poliſh from the nail. Colour white, with a ſhade of grey, yellow, or green; ſometimes pure white; ſometimes it contains dendritical figures; and ſometimes red veins.

Variety 2. Indurated ſteatites.

Fracture fine ſplintery, often mixed with imperfectly conchoidal. External luſtre 2 to 1, internal 0. Tranſparency 2. Often has the feel of ſoap. Abſorbs water. Colour yellowiſh or greeniſh grey; often veined or ſpotted with deep yellow or red.

Variety 3. Foliated or ſtriated ſteatites.

The texture of this variety is uſually foliated; ſometimes ſtriated. Fragments cubiform. Luſtre 3. Tranſparency 2 to 1. Hardneſs 6 to 7. Colour leek green, paſſing into mountain green or ſulphur yellow. Streak pale greeniſh grey. When heated to redneſs, it becomes grey; and at 147° Wedgewood, it forms a grey porous porcelain maſs.*

* *Kirwan,* i. 155.

A ſpecimen of ſteatites, analyſed by Klaproth, contained

59.5	ſilica,
30.5	magneſia,
2.5	iron,
5.5	water,
98.0 †.	

† *Beiträge,* ii. 179.

A ſpecimen of white ſteatites, analyſed by Mr Chenevix, contained

60.00	ſilica,
28.50	magneſia,
3.00	alumina,
2.50	lime,
2.25	iron.
96.25 ‡	

‡ *Ann. de Chim.* xxviii. 200.

83
G. XVIII.
MSI.
Chryſolite.

GENUS XVIII. MSI.

SPECIES 1. Chryſolite (G).

Peridot of the French—*Topaz* of the ancients.

The name *chryſolite* was applied, without diſcrimination, to a great variety of ſtones, till Werner defined it accurately, and confined it to that ſtone which the French chemiſts diſtinguiſh by the appellation of *peridot*. This ſtone is the *topaz* of the ancients; their chryſolite is now called *topaz*.§

§ *Plinii,* lib. 37. c. 8.

Chryſolite is found ſometimes in unequal fragments, and ſometimes cryſtallized.† The primitive form of its cryſtals is a right angled parallelopiped,‡ whoſe length, breadth, and thickneſs, are as 5, $\sqrt{8}$, $\sqrt{5}$.*

† Fig. 23.
‡ Fig. 24.
* *Hauy, Jour. de Min.* N° xxviii. 281.

The texture of the chryſolite is foliated. Its fracture conchoidal. Its internal luſtre from 2 to 4. Its tranſparency from 4 to 2. Cauſes double refraction. Hardneſs

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The carbonat of lime was only mechanically interpoſed between the fibres of the ſtone. See *Pallas, Neu. Nord. Beiträze,* 6 *Band,* p. 146.

(E) Hence the name *kiff-kil,* or rather *keff-kelli,* " clay froth," or " light clay."

(F) *Kirw.* I. 151.—*Pott, Mem. Berlin,* 1747, p. 57.—*Wiegleb, Jour. de Phyſ.* XXIX. 60.—*Lavoiſier, Mem. Par.* 1778, 433.

(G) *Kirw.* I. 262.—*Cartheuſer, Min.* 94.—*Dolomieu, Jour. de Min.* N° xxix. 365.—*La Metherie, Nouv. Jour. de Phyſ.* I. 397.

Hardneſs 9 to 10. Brittle. Sp. gr. from 3.265 to 3.45. Colour green. It is infuſible at 150°, but loſes its tranſparency, and becomes blackiſh grey.† With borax it melts without effervеſcence into a tranſparent glaſs of a light green colour. Infuſible with microcoſmic ſalt ‡ and fixed alkali.§

Variety 1. Common chryſolite.

Found in Ceylon, and South America, and in Bohemia, amidſt ſand and gravel.|| Luſtre 3 to 4. Tranſparency 4 to 3. Colour yellowiſh green, ſometimes verging to olive green, ſometimes to pale yellow.

Variety 2. Olive chryſolite—*Olivine*.¶

Found commonly among traps and baſalts; ſometimes in ſmall grains, ſometimes in pretty large pieces; but it has not been obſerved in cryſtals. Luſtre 2 to 3. Tranſparency 3 to 2. Colour olive green.

† Kir. Min. 263.

‡ Vauquelin, Ann. de Chim. xxi.

§ Kirw. ibid.

|| Coquebert, Jour. de Min. N° xii. 20.

¶ Kirwan's Min. i. 63.—Le Lievre, Jour. de Phyſ. xxx. 97.

The firſt variety, according to the analyſis of Klaproth, is compoſed of

41.5	magneſia,
38.5	ſilica,
19.0	oxyd of iron.
99.0†	

According to that of Vauquelin, it is compoſed of

51.5	magneſia,
38.0	ſilica,
9.5	oxyd of iron.
99.0 ‡	

The ſecond variety, according to the analyſis of Klaproth, is compoſed of

37.58	magneſia,
50.00	ſilica,
11.75	oxyd of iron,
.21	lime.
99.54 §.	

† Klaproth's Beiträge, i. 03.

‡ Ann. de Chim. ibid.

§ Beiträge, 112.

84
Jade.

SPECIES 2. Jade (H).

This ſtone was formerly called *lapis nephriticus*, and was much celebrated for its medical virtues. It is found in Egypt, China, America, and in the Siberian and Hungarian mountains. It is ſometimes adhering to rocks, and ſometimes in detached round pieces.

Its ſurface is ſmooth. Its fracture ſplintery. External luſtre 0, or ſcarce 1; internal waxy, 1. Tranſparency from 2 to 1. Hardneſs 10. Not brittle. Sp. gr. from 2.95 to 2.9829; or, according to Sauſſure, to 3.389. Feels greaſy. Looks as if it had imbibed oil. Colour dark leek green, or verging towards blue; in ſome prominencies inclining to greeniſh or bluiſh white. When heated it becomes more tranſparent and brittle, but is infuſible *per ſe*. According to Hœpfner, it is compoſed of

47	ſilica,
38	carbonat of magneſia,
9	iron,
4	alumina,
2	carbonat of lime,
100	

This is the ſtone which the inhabitants of New Zealand make into hatchets and other cutting inſtruments.

85
G. XIX.
SML.
Aſbeſtus.

GENUS XIX. SML.

SPECIES 1. Aſbeſtus (I).

This mineral was well known to the ancients. They even made a kind of cloth from one of the varieties, which was famous among them for its incombuſtibility. It is found abundantly in moſt mountainous countries, and no where more abundantly than in Scotland.

It is commonly amorphous. Its texture is fibrous. Its fragments often long ſplintery. Luſtre from 0 to 2; ſometimes 3, and then it is metallic. Tranſparency from 0 to 2. Hardneſs from 3 to 7. Sp. gr. from 2.7 to 0.6806. Abſorbs water. Colour uſually white or green. Fuſible *per ſe* by the blow-pipe.

Variety 1. Common Aſbeſtus.

Luſtre 2 to 1. Tranſparency 1. Hardneſs 6 to 7. Sp. gr. 2.577 to 2.7. Feels ſomewhat greaſy. Colour leek green; ſometimes olive or mountain green; ſometimes greeniſh or yellowiſh grey. Streak grey. Powder grey.

Variety 2. Flexible aſbeſtus.

Amiantus.

Compoſed of a bundle of threads ſlightly cohering. Fibres flexible. Luſtre 1 to 2, ſometimes 3. Tranſparency 1 to 2, ſometimes 0. Hardneſs 3 to 4. Sp. gr. before it abſorbs water, from 0.9088 to 2.3134; after abſorbing water, from 1.5662 to 2.3803.† Feels greaſy. Colour greyiſh or greeniſh white; ſometimes yellowiſh or ſilvery white, olive or mountain green, pale fleſh red, and mountain yellow.

† *Briſſon.*

Variety 3. Elaſtic abeſtus.

Mountain cork.

This variety has a ſtrong reſemblance to common cork. Its fibres are interwoven. Luſtre commonly 0. Opaque. Hardneſs 4. Sp. gr. before abſorbing water, from 0.6806 to 0.9933; after abſorbing water, from 1.2492 to 1.3492. Feels meagre. Yields to the fingers like cork, and is ſomewhat elaſtic. Colour white; ſometimes with a ſhade of red or yellow; ſometimes yellow or brown.

A ſpecimen of the firſt variety from Dalecarlia, analyſed by Bergman, contained

63.9	ſilica,
16.0	carbonat of magneſia,
12.8	carbonat of lime,
6.0	oxyd of iron,
1.1	alumina.
99.8 *	

A ſpecimen of the ſecond variety yielded to the ſame chemiſt

64.0	ſilica,
17.2	carbonat of magneſia,
13.9	carbonat of lime,
2.7	alumina,
2.2	oxyd of iron.
100.0 ‡	

A ſpecimen of the third variety contained, according to the ſame analyſis,

56.2	ſilica,
26.1	carbonat of magneſia,
12.7	carbonat of lime,
3.0	iron,
2.0	alumina.
100.0 ||	

Twelve

* *Opuſc.* iv. 170.

‡ *Ibid.* p. 163.

|| *Ibid.* p. 170.

(H) *Kirw.* I. 171.—*Bartolin*, *De Lapide Nephritico.*—*Lehmann*, *Nov. Comm. Petropol.* X. 381.—*Hœpfner*, *Hiſt. Nat. de la Suiſſe*, I. 251.

(I) *Kirw.* I. 159.—*Bergman*, IV. 160.—*Plot*, *Phil. Tranſ.* XV. 1051.—*Nebel*, *Jour. de Phyſ.* II. 62.—*Ibid.* III. 367.

Twelve different ſpecimens of aſbeſtus, analyſed by Bergman, yielded the ſame ingredients, differing a little in their proportions†.

† *Opuſc.* iv. 175.

86 Aſbeſtinite.

SPECIES 2. Aſbeſtinite (K).

This ſtone is amorphous. Texture foliated or broad ſtriated. Luſtre ſilky, 3. Tranſparency 1 to 2. Hardneſe 5 to 6. Sp gr. from 2.806 to 2.880. Colour white, with ſhades of red, yellow, green, or blue. At 150° Wedgewood it melts into a green glaſs.

87 G. XX. I. SILM. Pyroxen.

GENUS XX. I. SILM.

SPECIES 1. Pyroxen.

This ſtone is found abundantly in lava and other volcanic productions (L). It is always cryſtallized. The primitive form of its cryſtals is an oblique angled priſm, whoſe baſes are rhombs with angles of 92° 18′, and 37° 42′‡. It generally cryſtallizes in eight-ſided priſms, terminated by dihedral ſummits‖. Its texture is foliated. Hardneſs 9. Colour black; ſometimes green. Powder greeniſh grey*. Commonly attracted by the magnet†. Scarcely fuſible by the blow-pipe‡. With borax it melts into a yellowiſh glaſs, which appears red while it is hot§.

According to the analyſis of Vauquelin, it is compoſed of

52.00 ſilica,
14.66 oxyd of iron,
13.20 lime,
10.00 magneſia,
3.33 alumina,
2.00 oxyd of manganeſe.

95.19‖

‡ *Hauy, Jour. de Min.* N° xxviii. 269.
‖ *De Liſle,* ii. 398.
* *Vauquelin.*
† *Ferber.*
‡ *Le Lievre.*
§ *Vauquelin.*
‖ *Jour. de Min.* N° xxxix. 172.

88 Aſbeſtoid.

SPECIES 2. Aſbeſtoid*.

This ſtone has obtained its name from its ſimilarity to common aſbeſtus. It is amorphous. Its texture is foliated or ſtriated. Its luſtre common or glaſſy, from 2 to 3. Tranſparency from 0 to 1. Hardneſs 6 to 7. Sp. gr. from 3 to 3.31. Colour olive or leek green; when decompoſing, brown. Before the blowpipe it melts *per ſe* into a brown globule. With borax it forms a violet coloured globule verging towards hyacinth†. According to the analyſis of Mr Macquart, it is compoſed of

46 ſilica,
20 oxyd of iron,
11 lime,
10 oxyd of manganeſe,
8 magneſia.

95‡

* *Kirwan,* i. 166.
† *Macquart, Ann. de Chim.* xxii. 83.
‡ *Ibid.*

There is a variety of this ſpecies which Kirwan calls metalliform aſbeſtoid. Its luſtre is ſemimetallic, 3. Opaque. Hardneſs 8 to 9. Sp. gr. 3.356. Colour grey, ſometimes inclining to red*.

* *Kirwan's Min.* i. 167.

89 G. XX. 2. SMIL. Shorlaceous actinolite.

GENUS XX. 2. SMIL.

SPECIES 3. Shorlaceous actinolite (M).

This ſtone cryſtallizes in four or ſix-ſided priſms, thicker at one end than the other; hence it has been called by the Germans *ſtrahlſtein,* "arrow-ſtone." The cryſtals ſometimes adhere longitudinally. Fracture hackly. External luſtre glaſſy, 3 to 4; internal, 1 to 2. Tranſparency from 2 to 3; ſometimes 1. Hardneſs from 7 to 10. Sp. gr. 3.023 to 3.45. Colour leek or dark green.

This ſtone is often the matrix of iron, copper, and tin ores.

90 Lamellar actinolite.

SPECIES 5. Lamellar actinolite.

This ſtone reſembles hornblende. It is amorphous. Texture foliated. Luſtre various in different places. Tranſparency 0, or ſcarce 1. Sp. gr. 2.916. Colour dark yellowiſh or greeniſh grey.

91 Glaſſy actinolite.

SPECIES 6. Glaſſy actinolite.

This ſtone is found amorphous, compoſed of fibres adhering longitudinally, or in ſlender four or ſix-ſided priſms. Texture fibrous. Fragments long ſplintery, ſo ſharp that they can ſcarcely be handled without injury. External luſtre glaſſy or ſilky, 3 to 4; internal 0. Tranſparency 2. Exceedingly brittle. Sp. gr. 2.95 to 3.493. Colour leek green; ſometimes verging towards greeniſh or ſilver white; ſometimes ſtained with yellowiſh or browniſh red. According to Bergman it is compoſed of

72.0 ſilica,
12.7 carbonat of magneſia,
6.0 carbonat of lime,
7.0 oxyd of iron,
2.0 alumina.

99.7*

* *Opuſc.* iv. 171.

92 G. XXI. SL. Shiſtoſe hornſtone.

GENUS XXI. SL.

SPECIES 1. Shiſtoſe hornſtone†.

The ſtructure of this ſtone is ſlaty. Luſtre from 0 to 1. Commonly opaque. Hardneſs 9 to 10. Sp. gr. from 2.596 to 2.641. Colour dark bluiſh or blackiſh grey. Infuſible *per ſe.*

† *Kirwan,* i. 305.

Variety 1. Siliceous ſhiſtus.

Commonly interſected by reddiſh veins of iron ſtone. Fracture ſplintery. Luſtre 0. Tranſparency from 0 to 1.

Variety 2. Baſanite or Lydian ſtone.

Commonly interſected by veins of quartz. Fracture even; ſometimes inclining to conchoidal. Luſtre ſcarce 1. Hardneſs 10. Sp. gr. 2.596. Powder black. Colour greyiſh black.

This, or a ſtone ſimilar to it, was uſed by the ancients as a touchſtone. They drew the metal to be examined along the ſtone, and judged of its purity by the

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(K) *Kirw. Min.* I. 165. Is this the *tremolite* of Werner? It certainly is not the *tremolite* of the French mineralogiſts.

(L) Hence the name *pyroxen* given it by Hauy; from πυρ *fire,* and ξενος, *a ſtranger.* It means, as he himſelf explains it, a *ſtranger in the regions of fire.* By this he means to indicate, that pyroxen, though preſent in lava, is not a volcanic production.

(M) In this and the following ſpecies we have followed Mr Kirwan's new arrangement exactly, without even venturing to give the ſynonimes of other authors. The deſcriptions which have been given are ſo many and incomplete, and the minerals themſelves are ſtill ſo imperfectly known, and have got ſo many names, that no part of mineralogy is in a ſtate of greater confuſion.

the colour of the metallic ſtreak. On this account they called it *βασανος*, *the trier*. They called it alſo *Lydian ſtone*, becauſe, as Theophraſtus informs us, it was found moſt abundantly in the river Tmolus in Lydia†.

† *Hill's Theophraſtus, περι λιθων*, p. 190.

A ſpecimen of the firſt variety, analyſed by Wiegleb, contained

75.0 ſilica,
10.0 lime,
4.6 magneſia,
3.5 iron,
5.2 carbon.
———
98.3

This ſpecies is rather a mechanical mixture than a chemical combination.

93
G. XXII.
ZS
Zircon.

GENUS XXII. ZS.

SPECIES I. Zircon*.

Jargon—Hyacinth.

* *Kirwan*, i. 257. and 353.

This ſtone is brought from Ceylon, and found alſo in France, Spain, and other parts of Europe. It is commonly cryſtallized. The primitive form of its cryſtals is an octahedron§, compoſed of two four-ſided pyramids applied baſe to baſe, whoſe ſides are iſoſceles triangles (N). The inclination of the ſides of the ſame pyramid to each other is 124° 12′; the inclination of the ſides of one pyramid to thoſe of another 82° 50′. The ſolid angle at the apex is 73° 44′†. The varieties of the cryſtalline forms of zircon amount to ſeven. In ſome caſes there is a four-ſided priſm interpoſed between the pyramids of the primitive form; ſometimes all the angles of this priſm are wanting, and two ſmall triangular faces in place of each; ſometimes the cryſtals are dodecahedrons, compoſed of a flat four-ſided priſm with hexagonal faces, terminated by four-ſided ſummits with rhomboidal faces‖; ſometimes the edges of this priſm, ſometimes the edges where the priſm and ſummit join, and ſometimes both together, are wanting, and we find ſmall faces in their place. For an accurate deſcription and figure of theſe varieties, we refer to *Mr Hauy*‡.

§ Fig. 25.
† *Hauy. Jour. de Min.* N° xxvi. 91.
‖ Fig. 26.
‡ *Ibid.*

The texture of the zircon is foliated. Internal luſtre 3. Tranſparency from 4 to 2. Cauſes a very great double refraction. Hardneſs from 10 to 16. Sp. gr. from 4.2 to 4.165†. Colour commonly reddiſh or yellowiſh; ſometimes it is limpid.

† *Ibid.*

Before the blow-pipe it loſes its colour, but not its tranſparency. With borax it melts into a tranſparent glaſs. Infuſible with fixed alkali and microcoſmic ſalt.

1. The variety formerly called *hyacinth* is of a yellowiſh red colour, mixed with brown. Its ſurface is ſmooth. Its luſtre 3. Its tranſparency 3 to 4.

2. The variety formerly called *jargon of Ceylon*, is either grey, greeniſh, yellowiſh brown, reddiſh brown, or violet. It has little external luſtre. Is ſometimes nearly opaque.

The firſt variety, according to the analyſis of Vauquelin, is compoſed of

64.5 zirconia,
32.0 ſilica,
2.0 oxyd of iron.
———
98.5†

† *Ibid.* p. 106.

A ſpecimen analyſed by Klaproth contained

70.0 zirconia,
25.0 ſilica,
0.5 oxyd of iron.
———
95.5‡

‡ *Beiträge*, i. 231.

The ſecond variety, according to Klaproth, who diſcovered the component parts of both theſe ſtones, contains

68.0 zirconia,
31.5 ſilica,
0.5 nickel and iron.
———
100.0§

§ *Ibid.* i. 219.

ORDER II. SALINE STONES.

94
Genera.

UNDER this order we comprehend all the minerals which conſiſt of an earthy baſis combined with an acid. They naturally divide themſelves into five genera. We ſhall deſcribe them in the following order.

I. CALCAREOUS SALTS.
  Carbonat of lime,
  Sulphat of lime,
  Phoſphat of lime,
  Fluat of lime,
  Borat of lime.

II. BARYTIC SALTS.
  Carbonat of barytes,
  Sulphat of barytes.

III. STRONTITIC SALTS.
  Carbonat of ſtrontites,
  Sulphat of ſtrontites.

IV. MAGNESIAN SALTS.
  Sulphat of magneſia.

V. ALUMINOUS SALTS.
  Alum.

95
G. I. Calcareous ſalts.

GENUS I. CALCAREOUS SALTS.

This genus comprehends all the combinations of lime and acids which form a part of the mineral kingdom.

96
Carbonat of lime.

SPECIES I. Carbonat of lime.

No other mineral can be compared with carbonat of lime in the abundance with which it is ſcattered over the earth. Many mountains conſiſt of it entirely, and hardly a country is to be found on the face of the globe where, under the names of limeſtone, chalk, marble, ſpar, it does not conſtitute a greater or ſmaller part of the mineral riches.

It is often amorphous, often ſtalactitical, and often cryſtallized. The primitive form of its cryſtals is a parallelopiped, whoſe ſides are rhombs, with angles of 77° 30′ and 102° 30′‡. Its integrant molecules have the ſame form. The varieties of its cryſtals amount to more than 40; for a deſcription and figure of which we refer to *Romé de Liſle** and *Hauy* (O).

‡ Fig. 28.
* *Cryſtal.* i. 497.

When cryſtallized, its texture is foliated; when amorphous, its ſtructure is ſometimes foliated, ſometimes ſtriated, ſometimes granular, and ſometimes earthy. Its luſtre

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(N) Let ABC (fig. 27.) be one of the ſides. Draw the perpendicular BD; then AB = 5, BD = 4, AD = 3.

(O) *Eſſai d'une Theorie*, &c. p. 75.—*Jour. de Phyſ.* 1793, Auguſt, p. 114.—*Jour. d'Hiſt. Nat.* 1792, February, p. 148.—*Ann. de Chim.* XVII. 249. &c.—*Jour. de Min.* N° XXVIII. 304.

luſtre varies from 0 to 3. Tranſparency from 0 to 4. It cauſes double refraction; and it is the only mineral which cauſes double refraction through two parallel faces of the cryſtal. Hardneſs from 3 to 9. Sp. gr. from 2.315 to 2.78. Colour, when pure, white. Effervefces violently with muriatic acid, and diſſolves completely, or leaves but a ſmall reſiduum. The ſolution is colourleſs.

This ſpecies occurs in a great variety of forms; and therefore has been ſubdivided into numerous varieties. All theſe may be conveniently arranged under two general diviſions.

I. Soft carbonat of lime.

Variety 1. Agaric mineral.

Mountain milk, or *mountain meal* of the Germans.

This variety is found in the clefts of rocks, or the bottom of lakes. It is nearly in the ſtate of powder; of a white colour, ſometimes with a ſhade of yellow; and ſo light, that it almoſt floats on water.

Variety. 2. Chalk.

The colour of chalk is white, ſometimes with a ſhade of yellow. Luſtre 0. Opaque. Hardneſs 3 to 4. Sp. gr. from 2.315 to 2.657. Texture earthy. Adheres ſlightly to the tougue. Feels dry. Stains the fingers, and marks. Falls to powder in water. It generally contains about $\frac{2}{100}$ of alumina, and $\frac{3}{100}$ of water; the reſt is carbonat of lime.

Varicty 3. Arenaceous limeſtone.

Colour yellowiſh white. Luſtre 1. Tranſparency 1. So brittle, that ſmall pieces crumble to powder between the fingers. Sp. gr. 2.742. Phoſphoreſces in the dark when ſcraped with a knife, but not when heated. It conſiſts almoſt entirely of pure carbonat of lime.

Varicty 4. Teſtaceous tufa.

The colour of this variety is yellowiſh or greyiſh white. It is exceedingly porous and brittle; and is either compoſed of broken ſhells, or reſembles mortar containing ſhells; or it conſiſts of fiſtulous concretions variouſly ramified, and reſembling moſs.

II. Indurated carbonat of lime.

Variety 1. Compact limeſtone.

The texture of this variety is compact. It has little luſtre; and is moſt commonly opaque. Hardneſs 5 to 8. Sp. gr. 1.3864 to 2.72. Colour grey, with various ſhades of other colours. It moſt commonly contains about $\frac{1}{10}$th of alumina, oxyd of iron, &c.; the reſt is carbonat of lime. This variety is uſually burnt as lime.

Variety 2. Granularly foliated limeſtone.

Structure ſometimes ſlaty. Texture foliated and granular. Luſtre 2 to 1. Tranſparency 2 to 1. Hardneſs 7 to 8. Sp. gr. 2.71 to 2.8376. Colour white, of various ſhades from other colours.

Variety 3. Sparry limeſtone.

Structure ſparry. Texture foliated. Fragments rhomboidal. Luſtre 2 to 3. Tranſparency from 2 to 4; ſometimes 1. Hardneſs 5 to 6. Sp. gr. from 2.693 to 2.718. Colour white: often with various ſhades of other colours. To this variety belong all the cryſtals of carbonat of lime.

Variety 4. Striated limeſtone.

Texture ſtriated or fibrous. Luſtre 1 to 0. Tranſparency 2 to 1. Hardneſs 5 to 7. Sp. gr. commonly from 2.6 to 2.77. Colours various.

Variety 5. Swine ſtone.

Texture often earthy. Fracture often ſplintery. Luſtre 1 to 0. Tranſparency 0 to 1. Hardneſs 6 to 7. Sp. gr. 2.701 to 2.7121. Colour dark grey, of various ſhades. When ſcraped or pounded, it emits an urinous or garlic ſmell.

Variety 6. Oviform.

This variety conſiſts of a number of ſmall round bodies, cloſely compacted together. Luſtre 0. Tranſparency 0 or 1. Hardneſs 6 to 7.

97
Sulphat of lime.

SPECIES. 2. Sulphat of lime.

Gypſum—Selenite.

This mineral is found abundantly in Germany, France, England, Italy, &c.

It is found ſometimes in amorphous maſſes, ſometimes in powder. and ſometimes cryſtallized. The primitive form of its cryſtals, according to Romé de Liſle, is a decahedron ‡, which may be conceived as two four-ſided pyramids, applied baſe to baſe, and which, inſtead of terminating in pointed ſummits, are truncated near their baſes; ſo that the ſides of the pyramids are trapeziums, and they terminate each in a rhomb. Theſe rhombs are the largeſt faces of the cryſtal. The angles of the rhombs are 52° and 158°. The inclination of two oppoſite faces of one pyramid to the two ſimilar faces of the other pyramid is 145°, that of the other faces 110.* Sometimes ſome of the faces are elongated: ſometimes it cryſtallizes in ſix-ſided priſms, terminated by three or four-ſided ſummits, or by an indeterminate number of curvilinear faces. For a deſcription and figure of theſe varieties, we refer to *Romé de Liſle* †.

The texture of ſulphat of lime is moſt commonly foliated. Luſtre from 0 to 4. Tranſparency from 0 to 4. It cauſes double refraction. Its hardneſs does not exceed 4. Its ſp. gr. from 1.872 to 2.311. Colour commonly white or grey.

Before the blow-pipe, it melts into a white enamel, provided the blue flame be made to play upon the edges of its laminæ. When the flame is directed againſt its faces, the mineral falls into powder ‡.

It does not effervefce with muriatic acid, except it be impure; and it does not diſſolve in it.

The following varieties of this mineral are deſerving of attention.

Variety 1. Broad foliated ſulphat.

Texture broad foliated. Luſtre glaſſy, from 4 to 2. Tranſparency from 4 to 3. Hardneſs 4. Sp. gr. 2.311. Colour grey, often with a ſhade of yellow.

Variety 2. Grano-foliated ſulphat.

Texture foliated, and at the ſame time granular; ſo that is eaſily crumbles into powder. Luſtre 2 to 3. Tranſparency 2 to 3. Hardneſs 4 to 3. Sp. gr. from 2.274 to 2.310. Feels ſoft. Colour white or grey, often with a tinge of yellow, blue, or green; ſometimes fleſh red brown, or olive green.

Variety 3. Fibrous ſulphat.

Texture fibrous. Fragments long ſplintery. Luſtre 2 to 3. Tranſparency 2 to 1; ſometimes 3. Hardneſs 4. Brittle. Sp. gr. 2.300. Colour white, often with a ſhade of grey, yellow, or red; ſometimes fleſh red, and ſometimes honey yellow; ſometimes ſeveral of theſe colours meet in ſtripes.

Variety 4. Compact ſulphat.

Texture compact. Luſtre 1 or 0. Tranſparency 2 to 1,

‡ Fig. 29.

* *Cryſtal.* i. 144.

† *Ibid.*

‡ *Le Lievre, Jour. de Min.* N° xxviii. 315.

1, ſometimes 0. Hardneſs 4. Sp. gr. from 1.872 to 2.288. Feels dry, but not harſh. Colour white, with a ſhade of grey, yellow, blue, or green; ſometimes yellow; ſometimes red; ſometimes ſpotted, ſtriped, or veined.

Variety 5. Farinaceous ſulphat.

Of the conſiſtence of meal. Luſtre 0. Opaque. Scarcely ſinks in water. Is not gritty between the teeth. Feels dry and meagre. Colour white. When heated below redneſs, it becomes of a dazzling white.

SPECIES 3. Phoſphat of lime.

98 Phoſphat of lime.

Apatite—Phoſphorite—Chryſolite—of the French.

This ſubſtance is found in Spain, where it forms whole mountains, and in different parts of Germany. It is ſometimes amorphous, and ſometimes cryſtallized. The primitive form of its cryſtals is a regular ſix-ſided priſm. ‡ Its integrant molecule is a regular triangular priſm, whoſe height is to a ſide of its baſe as 1 to $\sqrt{2}$ §. Sometimes the edges of the primitive hexagonal priſm are wanting, and ſmall faces in their place; ſometimes there are ſmall faces inſtead of the edges which terminate the priſm; ſometimes theſe two varieties are united; ſometimes the terminating edges and the angles of the priſm are replaced by ſmall faces †; and ſometimes the priſm is terminated by four-ſided pyramids.*

Its texture is foliated. Its fracture uneven, tending to conchoidal. External luſtre from 2 to 3, internal 3 to 2. Tranſparency from 4 to 2. Cauſes ſingle refraction. Hardneſs 6 to 7. Brittle. Sp. gr. from 2.8249 to 3.218. Colour commonly green or grey; ſometimes brown, red, blue, and even purple.

It is infuſible by the blow-pipe. When its powder is thrown upon burning coals, it emits a yellowiſh green phoſphoreſcent light. It is ſoluble in muriatic acid without efferveſcence or decompoſition, and the ſolution often becomes gelatinous.

SPECIES 4. Fluat of lime.

99 Fluat of lime.

Fluor.

This mineral is found abundantly in different countries, particularly in Derbyſhire. It is both amorphous and cryſtallized.

The primitive form of its cryſtals in the regular octohedron; that of its integrant molecules the regular tetrahedron.* The varieties of its cryſtals hitherto obſerved amount to 7. Theſe are the primitive octohedron; the cube; the rhomboidal dodecahedron; the cubo octohedron †, which has both the faces of the cube and of the octohedron; the octohedron wanting the edges; the cube wanting the edges, and either one face ‡, or two faces in place of each. For a deſcription and figure of theſe we refer to *Mr Hauy* †.

The texture of fluat of lime is foliated. Luſtre from 2 to 3, ſometimes 0. Tranſparency from 2 to 4, ſometimes 1. Cauſes ſingle refraction. Hardneſs 8. Very brittle. Sp. gr. from 3.0943 to 3.1911. Colours numerous, red, violet, green, red yellow, blackiſh purple. Its powder thrown upon hot coals emits a bluiſh or greeniſh light. Two pieces of it rubbed in the dark phoſphoreſce. It decrepitates when heated. Before the blow-pipe it melts into a tranſparent glaſs ‡.

It admits of a poliſh, and is often formed into vaſes and other ornaments.

SPECIES 5. Borat of lime.

100 Borat of lime.

Boracite.

This mineral has been found at Kalkberg near Luneburg, ſeated in a bed of ſulphat of lime. It is cryſtallized. The primitive form of its cryſtals is the cube §. In general, all the edges and angles of the cube are truncated; ſometimes, however, only the alternate angles are truncated.* The ſize of the cryſtals does not exceed half an inch.

The texture of this mineral is compact. Its fracture is flat conchoidal. External luſtre 3; internal, greaſy, 2. Tranſparency from 2 to 3. Hardneſs 9 to 10. Sp. gr. 2.566. Colour greyiſh white, ſometimes paſſing into greeniſh white or purpliſh.

When heated it becomes electric; and the angles of the cube are alternately poſitive and negative †.

Before the blow-pipe it froths, emits a greeniſh light, and is converted into a yellowiſh enamel, garniſhed with ſmall points, which, if the heat be continued, dart out in ſparks ‖.

According to Weſtrum, who diſcovered its component parts, it contains

68	boracic acid,
13.5	magneſia,
11	lime,
1	alumina,
2	ſilica,
1	iron.
96 §	

SPECIES 6. Nitrat of lime.

101 Nitrat of lime.

Found abundantly mixed with native nitre. For a deſcription ſee the article CHEMISTRY in this *Supplement*, n° 672.

GENUS II. BARYTIC SALTS.

102 G. II. Barytic ſalts.

This genus comprehends the combinations of barytes with acids.

SPECIES 1. Carbonat of barytes.

103 Carbonat of barytes.

Witherite.

This mineral was diſcovered by Dr Withering; hence Werner has given it the name of *witherite*. It is found both amorphous and cryſtallized. The cryſtals are octohedrons or dodecahedrons, conſiſting of four or ſix-ſided pyramids applied baſe to baſe; ſometimes the ſix-ſided pyramids are ſeparated by a priſm; ſometimes ſeveral of theſe priſms are joined together in the form of a ſtar.

Its texture is fibrous. Its fracture conchoidal. Its fragments long ſplintery. Luſtre 2. Tranſparency 2 to 3. Hardneſs 5 to 6. Brittle. Sp. gr. 4.3 to 4.338. Colour greeniſh white. When heated it becomes opaque. Its powder phoſphoreſces when thrown on burning coals.*

It is ſoluble with efferveſcence in muriatic acid. The ſolution is colourleſs.

According to Pelletier it contains

62	barytes,
22	carbonic acid,
16	water.
100 †	

SPECIES 2. Sulphat of barytes.

104 Sulphat of barytes.

Boroſelenite.

This mineral is found abundantly in many countries, particularly in Britain. It is ſometimes in powder, often in amorphous maſſes, and often cryſtallized. The primitive form of its cryſtals is a rectangular priſm, whoſe baſes are rhombs, with angles of 101° 30′ and 78° 30′.‡ The varieties of its cryſtals are very numerous. For a deſcription and figure of them we refer to *Romé de Liſle* || and *Hauy*.* The moſt common varieties are the octohedron with cuneiform ſummits, the ſix or four-ſided priſm, the hexangular table with bevelled edges. Sometimes theſe cryſtals are needle form.

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‡ Fig. 30.

§ Hauy, Jour. de Min. N° xxviii. p. 310.

† Fig. 31.

* Hauy, ibid.

* Hauy, ibid. p. 325.

† Fig. 32.

‡ Fig. 33.

† Ibid.

‡ Ibid.

§ Hauy, Jour. de Min. N° xxviii. p. 325.

* Hauy, and Weſtrum.

† Hauy, ibid. and Ann. de Chim. ix. 59.

‖ Le Lievre, Jour. de Min. ibid.

§ Ann. de Chim. ii. 116.

* Hauy.

† Jour. de Min. N° xxi. p. 46.

Its texture is commonly foliated. Luſtre from 0 to 2. Tranſparency from 2 to 0; in ſome caſes 3 or 4. Hardneſs from 5 to 6. Sp. gr. from 4.4 to 4.44. Colour commonly white, with a ſhade of yellow, red, blue, or brown.

When heated it decrepitates. It is fuſible *per ſe* by the blue flame of the blow-pipe, and is converted into ſulphurat of barytes. Soluble in no acid except the ſulphuric; and precipitated from it by water.

Variety 1. Foliated ſulphat.

Luſtre 3 to 3. Tranſparency from 4 to 2, ſometimes 1. Colours white, reddiſh, bluiſh, yellowiſh, blackiſh, greeniſh. Mr Werner ſubdivides this variety into three, according to the nature of the texture. Theſe three ſubdiviſions are *granularly foliated*, *ſtraight foliated*, *curve foliated*.

Variety 2. Fibrous ſulphat.

Texture fibrous; fibres converging to a common centre. Luſtre ſilky or waxy, 2. Tranſparency 2 to 1. Hardneſs 5. Colours yellowiſh, bluiſh, reddiſh.

Variety 3. Compact ſulphat.

Texture compact. Luſtre 0 to 1. Tranſparency 1 to 0. Feels meagre. Almoſt conſtantly impure. Colours light yellow, red, or blue.

Variety 4. Earthy ſulphat.

In the form of coarſe duſty particles, ſlightly cohering. Colour reddiſh or yellowiſh white.

105
G. III.
Strontitic ſalts.

Genus III. Strontitic Salts.

This genus comprehends all the combinations of ſtrontites and acids which form a part of the mineral kingdom.

106
Carbonat of ſtrontites.

Species 1. Carbonat of ſtrontites.

This mineral was firſt diſcovered in the lead mine of Strontion in Argyleſhire; and ſince that time it is ſaid to have been diſcovered, though not in great abundance, in other countries. It is found amorphous, and alſo cryſtallized in needles, which, according to Hauy, are regular ſix-ſided priſms.

Its texture is fibrous; the fibres converge. Fracture uneven. Luſtre 2. Tranſparency 2. Hardneſs 5. Sp. gr. from 3.4 to 3.66. Colour light green. Does not decrepitate when heated. Before the blow-pipe becomes opaque and white, but does not melt. With borax it effervesces, and melts into a tranſparent colourleſs glaſs. Effervesces with muriatic acid, and is totally diſſolved. The ſolution tinges flame purple.

107
Sulphat of ſtrontites.

Species 2. Sulphat of ſtrontites.

Celeſtine.

This mineral has been found in Pennſylvania, in Germany, in France, in Sicily, and Britain. It was firſt diſcovered near Briſtol by Mr Clayfield. There it is found in ſuch abundance, that it has been employed in mending the roads.

It occurs both amorphous and cryſtallized. The cryſtals are moſt commonly bevelled tables, ſometimes rhomboidal cubes. Its texture is foliated. More or leſs tranſparent. Hardneſs 5. Sp. gr. from 3.51 to 3.96. Colour moſt commonly a fine ſky blue; ſometimes reddiſh; ſometimes white, or nearly colourleſs.*

Klaproth found a ſpecimen of this mineral from Pennſylvania compoſed of
58 ſtrontites,
42 ſulphuric acid.
——
100 †

According to the analyſis of Mr Clayfield, the ſulphat of ſtrontites found near Briſtol is compoſed of
58.25 ſtrontites,
41.75 ſulphuric acid of 2.24, and a little iron.‡
——
100.00

According to the analyſis of Vauquelin, the ſulphat of ſtrontites found at Bouvron in France, which was contaminated with .1 of carbonat of lime, is compoſed of
54 ſtrontites,
45 ſulphuric acid.
—
99 §

108
G. IV.
Magneſian Salts.

Genus IV. magneſian salts.

This genus comprehends the combinations of magneſia and acids which occur in the mineral kingdom. Only two ſpecies have hitherto been found; namely,

109
Sulphat of magneſia.

Species 1. Sulphat of magneſia.

It is found in Spain, Bohemia, Britain, &c.; and enters into the compoſition of many mineral waters.

For a deſcription of it, we refer to Chemistry, n° 633. in this *Suppl.*

110
Nitrat of magneſia.

Species 2. Nitrat of Magneſia.

Found ſometimes aſſociated with nitre. For a deſcription ſee Chemistry, n° 674.

111
G. V. Aluminous ſalts.

Genus V. aluminous salts.

This genus comprehends thoſe combinations of alumina and acids which occur in the mineral kingdom.

112
Alum.

Species 1. Alum.

This ſalt is found in cryſtals, in ſoft maſſes, in flakes, and inviſibly mixed with the ſoil. For a deſcription, we refer to Chemistry, n° 636.

Order III. AGGREGATES.

This order comprehends all mechanical mixtures of earths and ſtones found in the mineral kingdom. Theſe are exceedingly numerous: the mountains and hills, the mould on which vegetables grow, and indeed the greater part of the globe, may be conſidered as compoſed of them. A complete deſcription of aggregates belongs rather to geology than mineralogy. It would be improper, therefore, to treat of them fully here. But they cannot be altogether omitted; becauſe aggregates are the firſt ſubſtances which preſent themſelves to the view of the practical mineralogiſt, and becauſe, without being acquainted with the names and component parts of many of them, the moſt valuable mineralogical works could not be underſtood.

113
Diviſion of aggregates.

Aggregates may be comprehended under four diviſions: 1. Mixtures of earths; 2. Amorphous fragments of ſtones agglutinated together; 3. Cryſtallized ſtones, either agglutinated together or with amorphous ſtones; 4. Aggregates formed by fire. It will be exceedingly convenient

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‡ Hauy, Eſſai d'une Theorie, &c. p. 119.

|| Cryſtal. i. 588.

* Ibid. and Ann. de Chim. xii. 3.

* Clayfield, Nicholſon's Jour. iii. 36.

† Beiträge, ii. 97.

‡ Ibid. Nicholſon's Journal.

§ Jour. de Min. N° xxxvii. 6.

convenient to treat each of theſe ſeparately. We ſhall therefore divide this order into four ſections.

SECT. I. *Aggregates of Earths.*

THE moſt common earthy aggregates may be comprehended under the following genera:

1. Clay,
2. Colorific earths,
3. Marl,
4. Mould.

GENUS. I. CLAY.

114 Clay.

Clay is a mixture of alumina and ſilica in various proportions. The alumina is in a ſtate of an impalpable powder; but the ſilica is almoſt always in ſmall ſtones, large enough to be diſtinguiſhed by the eye. Clay, therefore, exhibits the character of alumina, and not of ſilica, even when this laſt ingredient predominates. The particles of ſilica are already combined with each other; and they have ſo ſtrong an affinity for each other, that few bodies can ſeparate them: whereas the alumina, not being combined, readily diſplays the characters which diſtinguiſh it from other bodies. Beſides alumina and ſilica, clay often contains carbonat of lime, of magneſia, barytes, oxyd of iron, &c. And as clay is merely a mechanical mixture, the proportion of its ingredients is exceedingly various.

Clay has been divided into the follow ſpecies:

SPECIES 1. Porcelain clay.

115 Porcelain clay.

Its texture is earthy. Its luſtre 0. Opaque. Hardneſs 4. Sp. gr. from 2.23 to 2.4. Colour white, ſometimes with a ſhade of yellow or red. Adheres ſlightly to the tongue. Feels ſoft. Falls to powder in water.

A ſpecimen, analyſed by Haſſenfratz, contained

62	ſilica,
19	alumina,
12	magneſia,
7	ſulphat of barytes.
100[*]	

A ſpecimen, analyſed by Mr Wedgewood, contained

60	alumina,
20	ſilica,
12	air of water.
92	

SPECIES 2. Common clay.

116 Common clay.

Its texture is earthy. Luſtre 0. Opaque. Hardneſs 3 to 6. Sp. gr. 1.8 to 2.68. Adheres ſlightly to the tongue. Often feels greaſy. Falls to powder in water. Colour, when pure, white: often tinged blue or yellow.

Variety 1. Potter's clay.

Hardneſs 3 to 4. Sp. gr. 1.8 to 2. Stains the fingers ſlightly. Acquires ſome poliſh by friction. Colour white; often with a tinge of yellow or blue; ſometimes browniſh, greeniſh, reddiſh. Totally diffuſible in water; and, when duly moiſtened, very ductile.

Variety 2. Indurated clay.

Hardneſs 5 to 6. Does not diffuſe itſelf in water, but falls to powder. Diſcovers but little ductility. Colours grey, yellowiſh, bluiſh, greeniſh, reddiſh, browniſh.

Variety 3. Shiſtoſe clay.

Structure ſlaty. Sp. gr. from 2.6 to 2.68. Feels ſmooth. Streak white or grey. Colour commonly bluiſh, or yellowiſh grey; ſometimes blackiſh, reddiſh, greeniſh. Found in ſtrata uſually in coal mines.

This variety is ſometimes impregnated with bitumen. It is then called bituminous *ſhale*.

SPECIES 3. Lithomarga.

117 Lithomarga.

Texture earthy. Fracture conchoidal. Luſtre from 0 to 2. Opaque. Hardneſs 3 to 7. Sp. gr. when pretty hard, 2.815. Surface ſmooth, and feels ſoapy. Adheres ſtrongly to the tongue. Falls to pieces, and then to powder, in water; but does not diffuſe itſelf through that liquid. Fuſible *per ſe* into a frothy maſs.

Variety 1. Friable lithomarga.

Formed of ſcaly particles ſlightly cohering. Luſtre 1 to 0. Hardneſs 3 to 4. Exceedingly light. Feels very ſmooth, and aſſumes a poliſh from the nail. Colour white; ſometimes tinged yellow or red.

Variety 2. Indurated lithomarga.

Hardneſs 4 to 7. The ſofter ſorts adhere very ſtrongly to the tongue when newly broken; the harder very moderately. Colours grey, yellow, red, brown, blue.

A ſpecimen of lithomarga from Oſmund, analyſed by Bergman, contained

60.0	ſilica,
11.0	alumina,
5.7	carbonat of lime,
4.7	oxyd of iron,
0.5	carbonat of magneſia,
18.0	water and air.
99.9[†]	

SPECIES 4. Bole.

118 Bole.

Texture earthy. Fracture conchoidal. Luſtre 0. Tranſparency ſcarce 1. Hardneſs 4. Sp. gr. from 1.4 to 2. Acquires a poliſh by friction. Scarcely adheres to the tongue. Feels greaſy. Colour yellow or brown; ſometimes red; ſometimes ſpotted.

The lemnian earth which belongs to this ſpecies, according to the analyſis of Bergman, contains

47.0	ſilica,
19.0	alumina,
6.0	carbonat of magneſia,
5.4	carbonat of lime,
5.4	oxyd of iron,
17.0	water and air.
99.8[‡]	

SPECIES 5. Fullers earth.

119 Fullers earth.

Texture earthy. Structure ſometimes ſlaty. Fracture imperfectly conchoidal. Luſtre 0. Opaque. Hardneſs 4. Receives a poliſh from friction. Does not adhere to the tongue. Feels greaſy. Colour uſually light green.

A ſpecimen from Hampſhire, analyſed by Bergman, contained

51.8	ſilica,
25.0	alumina,
3.3	carbonat of lime,
3.7	oxyd of iron,
0.7	carbonat of magneſia,
15.5	moiſture.
100.0[§]	

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[*] Ann. de Chim. xiv. 144.

[†] *Opuſc.* iv.

[‡] *Ibid.* p. 157.

[§] *Ibid.* 156.

This earth is uſed by fullers to take the greaſe out of their cloth before they apply ſoap. It is eſſential to fullers earth that the particles of ſilica be very fine, otherwiſe they would cut the cloth. Any clay, poſſeſſed of this laſt property, may be conſidered as *fullers earth*; for it is the alumina alone which acts upon the cloth, on account of its ſtrong affinity for greaſy ſubſtances.

120 G. II. Colorofic earths.

Genus II. Colorific Earths.

The minerals belonging to this genus conſiſt of clay, mixed with ſo large a quantity of ſome colouring ingredient as to render them uſeful as paints. The colouring matter is commonly oxyd of iron, and ſometimes charcoal.

121 Red chalk.

Species 1. Red chalk.

Reddle.

Texture earthy. Fracture conchoidal. Luſtre 0. Opaque. Hardneſs 4. Sp. gr. inconſiderable. Colour dark red.

Feels rough. Stains the fingers. Adheres to the tongue. Falls to powder in water. Does not become ductile. When heated it becomes black, and at 159° Wedgewood melts into a greeniſh yellow frothy enamel.

Compoſed of clay and oxyd of iron.

122 Yellow chalk.

Species 2. Yellow clalk.

Texture earthy. Fracture conchoidal. Hardneſs 3. Sp. gr. inconſiderable. Colour ochre yellow.

Feels ſmooth or greaſy. Stains the fingers. Adheres to the tongue. Falls to pieces in water. When heated becomes red; and at 156° Wedgewood melts into a brown porous porcelain.

According to Sage, it contains

50 alumina,
40 oxyd of iron,
10 water, with ſome ſulphuric acid.
100*

123 Black Chalk.

Species 3. Black chalk.

Structure ſlaty. Texture earthy. Fragments ſplintery. Luſtre 0. Opaque. Hardneſs 5. Sp. gr. 2.144 to 2.277. Colour black. Streak black.

Feels ſmooth. Adheres ſlightly to the tongue. Does not moulder in water. When heated to redneſs it becomes reddiſh grey.

According to Wiegleb, it is compoſed of

64.50 ſilica,
11.25 alumina,
11.00 charcoal,
2.75 oxyd of iron,
7.50 water.
97.00†

124 Green earth.

Species 4. Green earth.

Texture earthy. Luſtre 0. Opaque. Hardneſs 6 to 7. Sp. gr. 2.637. Colour green.

Commonly feels ſmooth. Does not ſtain the fingers. Often falls to powder in water. When heated it becomes reddiſh brown; and at 147° Wedgewood melts into a black compact glaſs.

Compoſed of clay, oxyds of iron and nickel.

125 G. III. Marl.

Genus III. Marl.

A mixture of carbonat of lime and clay, in which the carbonat conſiderably exceeds the other ingredient, is called *marl*.

Its texture is earthy. Luſtre 0. Opaque. Hardneſs from 4 to 8; ſometimes in powder. Sp. gr. from 1.6 to 2.877. Colour uſually grey, often tinged with other colours. Effervefces with acids.

Some marls crumble into powder when expoſed to the air; others retain their hardneſs for many years.

Marls may be divided into two ſpecies: 1. Thoſe which contain more ſilica than alumina; 2. Thoſe which contain more alumina than ſilica. Mr Kirwan has called the firſt of theſe *ſiliceous*, the ſecond *argillaceous*, marls. Attention ſhould be paid to this diſtinction when marls are uſed as a manure.

126 G. IV. Mould.

Genus IV. Mould.

By *mould* is meant the ſoil on which vegetables grow. It contains the following ingredients: ſilica, alumina, lime, magneſia (ſometimes), iron, carbon derived from decayed vegetable and animal ſubſtances, carbonic acid, and water. And the good or bad qualities of *ſoils* depends upon a proper mixture of theſe ingredients. The ſilica is ſeldom in the ſtate of an impalpable powder, but in grains of a greater or ſmaller ſize: Its chief uſe ſeems to be to keep the ſoil open and pervious to moiſture. If we paſs over the carbon, the iron, and the carbonic acid, the goodneſs of a ſoil depends upon its being able to retain the quantity of moiſture which is proper for the nouriſhment of vegetables, and no more. Now the retentive power of a ſoil increaſes with the proportion of its alumina, lime, or magneſia, and diminiſhes as the proportion of its ſilica increaſes. Hence it follows, that in a dry country, a fertile ſoil ſhould contain leſs ſilica, and more of the other earths, than in a wet country.

Giobert found a fertile ſoil near Turin, where it rains annually 30 inches, to contain

From 77 to 79 ſilica,
9 — 14 alumina,
5 — 12 lime,

Near Paris, where it rains about 20 inches annually, Mr Tillet found a fertile ſoil to contain

Coarſe ſand 25
Fine ſand 21
— 46.0 ſilica,
16.5 alumina,
37.5 lime.
100.0‡

The varieties of mould are too numerous to admit an accurate deſcription: we ſhall content ourſelves, therefore, with mentioning the moſt remarkable.

127 Sand.

Species 1. Sand.

This conſiſts of ſmall grains of ſiliceous ſtones not cohering together, nor ſoftened by water. When the grains are of a large ſize, the ſoil is called *gravel*.

128 Clay.

Species 2. Clay.

This conſiſts of common clay mixed with decayed vegetable and animal ſubſtances.

129 Loam.

Species 3. Loam.

Any ſoil which does not cohere ſo ſtrongly as clay, but more ſtrongly than chalk, is called *loam*. There are many varieties of it. The following are the moſt common.

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* *Mem. Par.* 1779, 313.

† *Ann. de Chim.* xxx. 13.

‡ *Kirwan on Manures.*

Variety 1. Clayey loam; called alſo *ſtrong*, *ſtiff*, *cold*, and *heavy*, loam.

It conſiſts of a mixture of clay and coarſe ſand.

Variety 2. Chalky loam.

A mixture of clay, chalk, and coarſe ſand; the chalk predominating.

Variety 3. Sandy loam.

A mixture of the ſame ingredients; the ſand amounting to .8 or .9 of the whole.

130 Till. SPECIES 4. Till.

Till is a mixture of clay and oxyd of iron. It is of a red colour, very hard and heavy.

SECT. II. *Aggregates of amorphous ſtones.*

THE aggregates which belong to this ſection conſiſt of amorphous fragments of ſtones cemented together. They may be reduced to the following genera:

1. Sandſtone,
2. Puddingſtone,
3. Amygdaloid,
4. Breccia.

131 G. I. Sandſtone. GENUS I. SANDSTONE.

Small grains of ſand, conſiſting of quartz, flint, hornſtone, ſiliceous ſhiſtus, or felſpar, and ſometimes of mica, cemented together, are denominated ſandſtones They feel rough and ſandy; and when not very hard, eaſily crumble into ſand. The cement or baſis by which the grains of ſand are united to each other is of four kinds; namely, lime, alumina, ſilica, iron. Sandſtones, therefore, may be divided into four ſpecies.

132 Calcareous. SPECIES 1. Calcareous ſandſtones.

Calcareous ſandſtones are merely carbonat of lime or marl, with a quantity of ſand interpoſed between its particles. Though the quantity of ſand, in many caſes, far exceeds the lime, calcareous ſandſtones are ſometimes found cryſtallized; and, in ſome caſes, the cryſtals, as might be expected, have ſome of the forms which diſtinguiſh carbonat of lime. Thus the calcareous ſandſtone of Fountainbleau is cryſtallized in rhomboidal tables. It contains, according to the analyſis of Laſſone

62.5 ſiliceous ſand,
37.5 carbonat of lime.

100

Calcareous ſandſtones have commonly an earthy texture. Their ſurface is rough. Their hardneſs from 6 to 7. Their ſpecific gravity about 2.5 or 2.6. Their colour grey; ſometimes yellowiſh or brown. They are ſometimes burned for lime.

133 Aluminous. SPECIES 2. Aluminous ſandſtones.

The baſis of argillaceous ſandſtones is alumina, or rather clay. Their ſtructure is often ſlaty. Their texture is compact, and either fine or coarſe grained, according to the ſize of the ſand of which they are chiefly compoſed. Their hardneſs is from 6 to 8, or even 9. Their colour is uſually grey, yellow, or brown.

They are often formed into mill-ſtones, filtering-ſtones, and coarſe whet-ſtones.

134 Siliceous. SPECIES 3. Siliceous ſandſtones.

Siliceous ſandſtones conſiſt of grains of ſand cemented together by ſilica, or ſome ſubſtance which conſiſts chiefly of ſilica or flint. They are much harder than any of the other ſpecies.

Sometimes ſtones occur, conſiſting of grains of lime cemented together with ſilica. Theſe ſtones are alſo denominated ſiliceous ſandſtones.

135 Ferruginous. SPECIES 4. Ferruginous ſandſtones.

The iron which acts as a cement in ferruginous ſandſtones is not far from a metallic ſtate. When iron is completely oxydated, it loſes the property of acting as a cement. This is the reaſon that ferruginous ſandſtones, when expoſed to the air, almoſt always crumble into powder.

The colour of ferruginous ſandſtones is uſually dark red, yellow, or brown. The grains of ſand which compoſe them are often pretty large. Their hardneſs is commonly inconſiderable.

136 G. II. Pudding ſtone. GENUS II. PUDDING STONE.

Pebbles of quartz, flint, or other ſimilar ſtones of a round or eliptical form, from the ſize of rape ſeed to that of an egg, cemented together by a ſiliceous cement, often mixed with iron, have been denominated *pudding ſtones*.

Pudding ſtones, of courſe, are not inferior in hardneſs to quartz, flint, chalcedony, &c. of which the pebbles may conſiſt. The colour of the cement is uſually yellow, brown, or red. Its fracture is conchoidal.

The finer ſorts of pudding ſtones are capable of a fine poliſh; the coarſe are uſed for mill-ſtones.

137 G. III. Amygdaloid. GENUS III. AMYGDALOID.

Rounded or eliptical maſſes of chalcedony, zeolite, limeſtone, lithomarga, ſteatites, green earth, garnets, hornblend, or opal, cemented together by a baſis of indurated clay, trap, mullen, walken or kragg, conſtitute an *amygdaloid*.

Amygdaloids are opaque. They have no luſtre. Their fracture is uneven or conchoidal. Hardneſs 6 to 9. Their colours are as various as the ingredients of which they are compoſed.

138 G. IV. Breccia. GENUS IV. BRECCIA.

Angular fragments of the ſame *ſpecies* of ſtone agglutinated together, conſtitute a *breccia*. Thus *calcareous* breccia conſiſts of fragments of marble cemented together by means of lime.

SECT. III. *Aggregates of Chryſtals.*

THE minerals belonging to this ſection conſiſt either of cryſtals of different kinds cemented together, or of cryſtals and amorphous ſtones cemented together.

They may be reduced under the following genera.

1. Granite.
2. Sienite.
3. Granatine.
4. Granitell.
5. Granilite.
6. Trap.
7. Porphyry.

139 G. I. Granite. GENUS I. GRANITE.

An aggregate of felſpath, quartz, and mica, whatever be the ſize or the figure of the ingredients, is denominated *granite*. This aggregate may be divided into two ſpecies, namely, *common* granite, and *ſhiſtoſe* granite or gneiſs.

140 Common. SPECIES 1. Common granite.

Its ſtructure is always granular. The felſpar is often amorphous, and conſtitutes moſt frequently the greateſt part of the aggregate.

Common granites differ much in their appearance, according to the ſize, proportion, colour, and figure of their component parts. They are commonly very hard: Their ſpecific gravity varies from 2.5388 to 2.9564.

141 Gneiſs.

SPECIES 2. Shiſtoſe granite or gneiſs.

The ſtructure of gneiſs is always ſlaty, and this conſtitutes its ſpecific character. In gneiſs, the proportion of quartz and felſpar is nearly equal: the proportion of mica is ſmalleſt. It is evidently ſubject to the ſame varieties with common granite.

142 G. II. Sienite.

GENUS II. Sienite.

Mr Werner has given the name of *ſienite* to aggregates compoſed of felſpar, hornblende, and quartz; or of felſpar, hornblende, quartz, and mica. Theſe aggregates were formerly confounded with quartz.

Sienite is found both of a granular and ſlaty ſtructure: it might, therefore, like granite, be divided into two ſpecies. In ſienite the quartz is commonly in by far the ſmalleſt proportion.

143 G. III. Granatine.

GENUS III. GRANATINE.

Mr Kirwan has applied the name *granatine* to the following aggregates.

Quartz, Felſpar, Shorl.	Quartz, Mica, Garnet.	Quartz, Hornblende, Jade.	Felſpar, Mica, Shorl.
Quartz, Felſpar, Jade.	Quartz, Shorl, Hornblende,	Quartz, Hornblende, Garnet.	Felſpar, Mica, Hornblende.
Quartz, Felſpar, Garnet.	Quartz, Shorl, Jade.	Quartz, Jade, Garnet.	Felſpar, Quartz, Serpentine.
Quartz, Mica, Shorl.	Quartz, Shorl, Garnet.	Quartz, Hornblende, Hornſtone.	Felſpar, Quartz, Steatites.
Quartz, Mica, Jade.			

One of theſe aggregates, namely, *quartz, mica, garnet*, was called by Cronſtedt *norka* or *murkſten*.

144 G. IV. Granitell.

GENUS IV. GRANITELL.

Mr Kirwan gives the name of *granitell* to all aggregates compoſed of any two of the following ingredients: quarts, felſpath, mica, ſhorl, hornblende, jade, garnet, ſteatites. The moſt remarkable of theſe are:

Quartz, Felſpar.	Quartz, Hornblende.	Quartz, Steatites.	Felſpar, Hornblende.
Quartz, Mica.	Quartz, Jade.	Felſpar, Mica.	Felſpar, Jade.
Quartz, Shorl.	Quartz, Garnet.	Felſpar, Shorl.	Felſpar, Garnet.
Mica, Shorl.	Mica, Jade.	Hornblende, Jade.	Jade, Garnet.
Mica, Hornblende.	Mica, Garnet.	Hornblende, Garnet.	Steatites, Shorl.

Some of theſe aggregates have received particular names. The aggregate of *quartz* and *mica*, when its ſtructure is ſlaty, is called by Werner *ſhiſtoſe mica*: by the Swedes, it is denominated *ſtellſten*, whatever be its ſtructure.

The aggregate of hornblende and mica is called *grunſtein*, from the dark green colour which it uſually has.

145 G. V. Granilite.

GENUS V. GRANILITE.

Under the name of *granilite*, Mr Kirwan comprehends all aggregates containing more than three ingredients. Of theſe the following are the moſt remarkable.

Quartz, Felſpar, Mica, Shorl.	Quartz, Mica, Shorl, Garnet.	Quartz, Sulph. of barytes, Mica, Shorl.
Quartz, Felſpar, Mica, Steatites.	Quartz, Felſpar, Mica, Garnet.	Quartz, Sulph. of barytes, Mica, Hornblende.

146 G. VI. Trap.

GENUS VI. TRAP. (P).

Under this genus we claſs not only what has commonly been called *trap*, but alſo wacken, and mullen, and kragſtone of Kirwan.

147 Common.

SPECIES I. Common trap.

This ſtone is very common in Scotland, and is known by the name of *whinſtone*. Whole hills are formed of it; and it occurs very frequently in large rounded detached fragments. Sometimes it aſſumes the form of immenſe columns, and is then called *baſalt*. The Giants Cauſeway in Ireland, the iſland of Staffa, and the ſouth ſide of Arthur's Seat in Scotland, are well known inſtances of this figure.

Its texture is earthy or compact. Its fracture uneven. Its luſtre commonly 0. Opaque. Hardneſs 8 to 9. Not brittle. Sp. gr. from 2.78 to 3.021.* Colour black, with a ſhade of grey, blue, or purple; ſometimes blackiſh or reddiſh brown; in ſome caſes greeniſh grey. By expoſure to the atmoſphere, it often becomes inveſted with a browniſh rind. Before the blow-pipe, it melts *per ſe* into a more or leſs black glaſs.

Trap conſiſts of ſmall cryſtals of hornblende, felſpar, olivine, &c. uſually ſet in a ground compoſed apparently of clay and oxyd of iron. A ſpecimen, in the form of baſaltes, from Staffa, analyſed by Dr Kennedy of Edinburgh, contained 48 ſilica,

16 alumina,
16 oxyd of iron,
9 lime,
5 moiſture,
4 ſoda,
1 muriatic acid.

99†

A

* *Kirwan.*

† *Edin. Tranſ.* v. 89.

(P) *Kirw.* I. 231 and 431.—*Faujas de St Fond. Eſſai ſur l'Hiſt. Nat. des Roches de Trap.*—*Phil. Tranſ.* paſſim. See alſo a very ingenious ſet of experiments on the fuſion of trap, by Sir James Hall in *Tranſ. Edin.* V. 43.

A ſpecimen from Saliſbury rock, near Edinburgh, contained, according to the analyſis of the ſame gentleman,

46.0	ſilica,
19.0	alumina,
17.0	oxyd of iron,
8.0	lime,
4.0	moiſture,
3.5	ſoda,
1.0	muriatic acid.
98.5 ‡	

Dr Kennedy conducted theſe analyſes with great ingenuity and judgment; and the diſcovery in which they terminated, that trap contains ſoda, is certainly of importance, and may lead to valuable conſequences both in a geological and mineralogical view.

148 Wacken.

SPECIES 2. Wacken.*

This ſtone often forms conſiderable parts of hills, and, like trap, is amorphous. Its texture is earthy. Its fracture uſually even. Luſtre 0. Opaque. Hardneſs 6 to 9. Sp. gr. from 2.535 to 2.893 †. Colour grey, with a ſhade of green, black, red, brown. When expoſed to the atmoſphere, it withers and becomes more grey.

It melts into a grey porous ſlag.

149 Mullen.

SPECIES 3. Mullen ‡

This ſtone is alſo found in conſiderable maſſes, and ſometimes has a tendency to a columnar form like baſalt. Texture earthy. Fracture uneven, and fine ſplintery. Luſtre 0, except from ſome ſhining particles of baſaltine. Opaque. Hardneſs from 7 to 9. Sp. gr. from 2.6 to 2.738. Colour aſh or bluiſh grey; ſometimes mixed with ochre yellow, in conſequence of the decompoſition of the ſtone. At 130° Wedgewood it melts into a black compact glaſs.

When mullen is expoſed to the air, its ſurface becomes covered with a greyiſh white rind, ſometimes ſlightly ochry.

150 Kragſtone.

SPECIES 4. Kragſtone.*

This ſtone, which like the others, forms conſiderable parts of rocks, was formed into a diſtinct ſpecies by Mr Kirwan. Its texture is earthy. It is exceedingly porous, and the pores are often filled with the cryſtals of other minerals. Fracture uneven. Luſtre 0. Opaque. Hardneſs 5 to 7. Sp. gr. 2.314. Feels rough and harſh. Colour reddiſh grey. Streak yellowiſh grey. At 138° Wedgewood it melts into a reddiſh brown porcelain maſs.

151 G. VII. Porphyry.

GENUS VII. PORPHYRY.

Any ſtone which contains ſcattered cryſtals or grains of felſpar, viſible to the naked eye, is denominated a *porphyry*. Beſides felſpar, porphyries generally contain ſmall cryſtals of quartz, hornblende, and mica. Theſe cryſtals are uſually of a different colour from the ſtone in which they are found, and they are ſtuck in it as in a cement. It is evident from this definition, that the number of porphyries muſt be great. Each ſpecies receives its name from the ſtone which forms its baſis. To deſcribe them would be unneceſſary. We ſhall only give a catalogue of the principal ſpecies.

1. Hornſtone porphyry.
2. Pitchſtone porphyry.
3. Hornſlate porphyry.
4. Felſpar or petunſe porphyry.
5. Clay porphyry.
6. Hornblende porphyry.
7. Trap porphyry.
8. Wacken porphyry.
9. Mullen porphyry.
10. Krag porphyry.
11. Argillitic porphyry.
12. Potſtone porphyry.
13. Serpentine porphyry.
14. Sandſtone porphyry.

The aggregates belonging to this ſection compoſe moſt of the mountains of the globe. In giving an account of them, we have adhered implicitly to the arrangement moſt generally received by mineralogiſts. It muſt be acknowledged that this arrangement is by no means complete, and that ſome of the genera are too vague to be of much uſe. The number of aggregates already diſcovered is too great for giving to each a particular name. Perhaps it would be better henceforth to adopt the method propoſed by Mr Hauy, namely, to conſtitute the genera from that ingredient which enters moſt abundantly into the aggregate, and which forms as it were its baſis, and to diſtinguiſh the ſpecies according to the nature and proportion of the other ingredients. According to this plan, the aggregates hitherto diſcovered have been divided by Hauy into the following genera:

1. Felſpathic rock.
2. Quartzous rock.
3. Micaceous rock.
4. Chloritous rock.
5. Serpentine rock.
6. Trappean rock.
7. Hornblendean rock.
8. Petro-ſiliceous rock.
9. Garnetic rock.
10. Calcareous rock.
11. Argillaceous rock.
12. Corneous rock.

SECT. IV. *Volcanic Aggregates.*

AGGREGATES formed by volcanoes may be reduced to the following genera.

1. Lava.
2. Tufa.
3. Pumice.
4. Aſhes.

152 G. I. Lava.

GENUS I. LAVA.

All ſubſtances which have iſſued out of a volcano in a ſtate of fuſion are called *lavas*. They have been divided into three ſpecies.

153 Vitreous.

SPECIES 1. Vitreous lava.

Found in ſmall pieces.

Texture gloſſy. Fracture conchoidal. Luſtre 3. Tranſparency from 3 to 1. Hardneſs 9 to 10. Sp. gr. from 2 to 3. Colour blackiſh, greeniſh, or whitiſh. Commonly ſomewhat porous.

154 Cellular.

SPECIES 2. Cellular lava.

This ſpecies is full of cells. Surface rough and full of cavities. Texture earthy. Luſtre 0. Opaque. Hardneſs 7 to 9. Sp. gr. varies, but does not exceed 2.8. Colour brown or greyiſh black. Commonly ſomewhat magnetic.

155 Compact.

SPECIES 3. Compact lava.

This ſpecies is the moſt common of all; it runs into the ſecond by inſenſible degrees; and indeed is ſeldom found of any conſiderable ſize without ſome pores. It bears in general a very ſtrong reſemblance to trap.

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‡ Edin. Tranſ. v. 90.

* Kirw. i. 225.

† Kirwan.

‡ Kirw. i. 225.

* Kirw. i. 226.

A ſpecimen of the lava of Catania in Sicily, analyſed by Dr Kennedy, contained

51.0	ſilica,
19.0	alumina,
14.5	oxyd of iron,
9.5	lime,
4.0	ſoda,
1.0	muriatic acid.
99.0†	

A ſpecimen of the lava of Sta. Venere in Sicily he found to contain

50.75	ſilica,
17.50	alumina,
14.25	oxyd of iron,
10.00	lime,
4.00	ſoda,
1.00	muriatic acid.
97.5‡.	

Thus we ſee, that the reſemblance between trap and lava holds not only in their external appearance, but alſo in their component parts.

156 G. II. Puzzolana.

GENUS II. PUZZOLANA.

Found in ſmall pieces. Surface rough. Texture earthy and porous. Fracture uneven. Luſtre 0. Opaque. Hardneſs 3. Very brittle. Sp. gr. from 2.57 to 2.8. Colour brown or dark grey. Magnetic. Eaſily melts into a black ſlag.

When mixed with lime into a mortar, it poſſeſſes the property of hardening even under water. This property it owes moſt probably, as Mr Kirwan ſuppoſes, to the iron which it contains. The iron decompoſes the water of the mortar, and by this means it becomes too hard to be acted upon by water in a very ſhort time.

157 G. III. Pumice.

GENUS III. PUMICE.

This is a very light ſubſtance ejected from volcanoes. It is porous. Hardneſs 3. Brittle. Sp. gr. below 1. Colour grey or brown.

In ſome varieties the luſtre and tranſparency are 0: in others, the luſtre is glaſſy, 2. Tranſparency from 1 to 2.

158 G. IV. Volcanic aſhes.

GENUS IV. VOLCANIC ASHES.

Theſe are analogous to the aſhes of common pit coal. Looſe and ſmooth, very light, and fine. Slowly diffuſible in water, and when wet ſomewhat ductile.

CLASS II. SALTS.

UNDER this claſs we comprehend all the combinations of alkalies with acids which exiſt in the mineral kingdom. As they have been already deſcribed in the article CHEMISTRY, *Suppl.* we ſhall here only give a liſt of their names.

159 Genera.

GENUS I. POTASS.

Sp. 1. Sulphat of potaſs.
2. Nitrat of potaſs.

GENUS II. SODA.

Sp. 1. Carbonat of ſoda.
2. Sulphat of ſoda.
3. Muriat of ſoda.
4. Borax.

GENUS III. AMMONIA.

Sp. 1. Sulphat of ammonia.
2. Muriat of ammonia.

CLASS III. COMBUSTIBLES.

160 Genera.

THE combuſtible ſubſtances belonging to the mineral kingdom, excluding the metals, may be comprehended under the following genera.

1. Sulphur.
2. Carbon.
3. Bitumen.
4. Coal.
5. Amber.

161 G. I. Sulphur.

GENUS I. SULPHUR.

SPECIES 1. Native ſulphur.

This ſubſtance is found abundantly in many parts of the world, eſpecially near volcanoes, as Hecla, Ætna, Veſuvius, the Lipari iſlands, &c. It is either in the ſtate of powder, or maſſive, or cryſtallized. The primitive form of its cryſtals is an octohedron, compoſed of two four-ſided pyramids, joined baſe to baſe†. The ſides of theſe pyramids are ſcalene triangles, and ſo inclined that the plane where the baſes of the pyramids join is a rhomb, whoſe long diagonal is to its ſhort as 5 to 4*. Sometimes the apices of the pyramids, to uſe the language of De Liſle, are truncated; ſometimes they are ſeparated from each other by a priſm; ſometimes they are truncated near their baſes, and a low four-ſided pyramid riſes from the truncature: this pyramid is alſo ſometimes truncated near its apex‡. Finally, one of the edges of the pyramids is ſometimes truncated. For figures of theſe varieties, and for the laws of their formation, we refer to *Mr Lefroy*†.

Colour yellow, with a ſhade of green; ſometimes reddiſh (q). Luſtre greaſy, 2. Tranſparency varies from 0 to 4. Cauſes double refraction‡. Texture compact. Hardneſs 4 to 5. Brittle—For its other properties, we refer to CHEMISTRY in this *Suppl.*

Sometimes ſulphur is mixed with different proportions of earths. Theſe combinations are hardly ſuſceptible of accurate deſcription.

Sulphur combines alſo with metals. Theſe combinations ſhall be deſcribed in the fourth claſs.

162 G. II. Carbon.

GENUS II. CARBON.

This genus comprehends all minerals compoſed of pure carbon, or of carbon combined with a little earth.

163 Diamond.

SPECIES 1. Diamond.

This mineral, which was well known to the ancients, is

† *Tranſ. Edin.* v. 93.

‡ *Ibid.* 94.

† Fig. 34.

* *Romé de Liſle*, i. 292. *Hauy* and *Lefroy*, *Jour. de Min.* N° xxix. 337.

‡ Fig. 35.

† *Jour. de Min.* N° xxix. 337.

‡ *Hauy.*

(q) It then contains arſenic.

Combuſtibles.

is found in different parts of Aſia, particularly in the kingdoms of Golconda and Viſapour; it is found alſo in Brazil.

It is always cryſtallized; but ſometimes ſo imperfectly, that at the firſt ſight it might paſs for amorphous. Its primitive form is a regular octogon†; but it more commonly aſſumes a ſpheroidal form, and then has uſually 36 curvilinear triangular faces, ſix of which are raiſed upon each of the faces of the primitive octogon‡. Its integrant molecule, according to Hauy, is a regular tetrahedron.—For a more particular account of the cryſtals of this mineral, we refer the reader to *Mr Romé de Liſle** and *Mr Hauy*†.

† Fig. 36.

‡ Fig. 37.

* *Cryſt.* ii. 191.

Texture foliated. Luſtre 4. Tranſparency from 2 to 4. Cauſes ſingle refraction. Hardneſs 20. Sp. gr. 3.5185 to 3.5310‡. Colour various; ſometimes limpid, ſometimes red, orange, yellow, green, blue, and even blackiſh.

† *Jour. de Min.* N° xxix. 343.

‡ *Hauy, ibid.*

When rubbed it becomes poſitively electric, even before it has been cut by the lapidary, which is not the caſe with any other gem‖.

It is compoſed of pure carbon§.

‖ *Id. ibid.*

§ *Morveau, Ann. de Chim.* xxxi. 72.

164 Mineral charcoal.

SPECIES 2. Mineral charcoal.

Kilkenny coal—Wales culm.

This mineral has been found in Hungary, Italy, France, Ireland, and Wales. It occurs in ſtratified maſſes, or in lumps neſted in clay.

Colour black. Luſtre 4, metallic. Opaque. Texture foliated. Hardneſs 5 to 7. Sp. gr. 1.4 to 1.526. Often ſtains the fingers. Inſoluble in acids. Deflagrates with nitre. Does not burn till wholly ignited, and then conſumes ſlowly without emitting flame or ſmoke.

It conſiſts almoſt entirely of *charcoal*, which, as Morveau has proved, is an oxyd of carbon*.

* *Ibid.*

165 Anthracite.

SPECIES 3. Anthracite (R).

Anthracolite.

This ſubſtance, as Dolomieu informs us, is found excluſively in the primitive mountains. It is always amorphous. Colour black or browniſh black. Luſtre 3 to 4. Structure ſlaty. Fragments rhomboidal. Hardneſs 6 to 7. Sp. gr. greater than that of coal. Often ſtains the fingers.

Burns preciſely like the laſt ſpecies, and leaves .40 of white aſhes. According to Dolomieu, it is compoſed of about

64.0 charcoal,
32.5 ſilica,
3.5 iron.

100.0†

† *Jour. de Min.* N° xxix. 338.

It is probable that the charcoal in the two laſt ſubſtances is in the ſame ſtate in which it exiſts in plumbago, combined with oxygen, but not containing ſo much as charcoal does‡.

‡ *Morveau, ibid.*

166 G. III. Bitumen.

GENUS III. BITUMEN.

By bitumen we underſtand, with mineralogiſts in general, an oil, which is found in different parts of the earth, in various ſtates of conſiſtence. Theſe different ſtates form diſtinct ſpecies; in our arrangement of which we ſhall be guided by the obſervations which Mr Hatchett has made in his valuable paper on bituminous ſubſtances*.

* *Nicholſon's Journal*, ii. 201, 248.

SPECIES 1. Naphtha.

167 Naphtha.

This ſubſtance is found ſometimes on the ſurface of the water of ſprings, and ſometimes iſſuing from certain ſtrata. It is found in great abundance in Perſia.

It is as fluid and tranſparent as water. Colour white or yellowiſh white. Smell ſtrong, but not diſagreeable. Sp. gr. when white, .708* or .729†; when yellowiſh, .8475‡. Feels greaſy. Catches fire on the approach of flame, burns with a white flame, and leaves ſcarce any reſiduum.

* *Muſchenbroek.*

† *Boulduc.*

‡ *Briſſon.*

Inſoluble in alcohol. Does not freeze at 0° Fahrenheit. When pure naphtha is expoſed to the air, it becomes yellow and then brown; its conſiſtence is increaſed, and it paſſes into *petroleum**.

* *Hatchett.*

168 Petroleum.

SPECIES 2. Petroleum.

This ſubſtance is alſo found in Perſia, and likewiſe in many countries in Europe, particularly Italy, France, Switzerland, Germany, Sweden, England, and Scotland.

Not ſo fluid nor tranſparent as water. Colour yellow, either pale or with a ſhade of red or green; reddiſh brown and reddiſh black. Smell that of naphtha, but leſs pleaſant. Sp. gr. .8783*. When burned it yields a ſoot, and leaves a ſmall quantity of coaly reſiduum.

* *Briſſon.*

By expoſure to the air it becomes like tar, and is then called *mineral tar*†.

† *Hatchett, ibid.*

169 Mineral tar.

SPECIES 3. Mineral tar.

This ſubſtance is found in many parts of Aſia, America, and Europe. It is viſcid, and of a black, browniſh black, or reddiſh colour. Smell ſometimes ſtrong, but often faint. Sp. gr. 1.1. When burned, emits a diſagreeable bituminous ſmell. By expoſure to the air it paſſes into *mineral pitch* and *maltha**.

* *Hatchett, ibid.*

170 Mineral pitch and maltha.

SPECIES 4. Mineral pitch and maltha.

This ſubſtance has a ſtrong reſemblance to common pitch. When the weather is warm it is ſoft, and has ſome tenacity; it is then called *adheſive mineral pitch*: when the weather is cold, it is brittle; its hardneſs is 5; and its fracture has a glaſſy luſtre. In this ſtate it is called *maltha*. Colour black, dark brown, or reddiſh. Luſtre 0. Opaque. Sp. gr. from 1.45 to 2.07. Does not ſtain the fingers. On a white hot iron it flames with a ſtrong ſmell, and leaves a quantity of grey aſhes. It is to the preſence of the earths which compoſe theſe aſhes that the great ſpecific gravity of this bitumen is to be aſcribed. By farther induration, it paſſes into *aſphalt*.

171 Aſphalt.

SPECIES 5. Aſphalt.

This ſubſtance is found abundantly in many parts of Europe, Aſia, and America, eſpecially in the iſland of Trinidad.

Colour black or browniſh black. Luſtre greaſy 2. Opaque. Fracture conchoidal, of a glaſſy luſtre. Hardneſs from 7 to 8. Very brittle. Sp. gr. 1.07 to 1.165*. Feel ſmooth, but not greaſy. Does not ſtain the fingers. Has little or no ſmell, unleſs when rubbed or heated. When heated melts, ſwells, and inflames; and when pure, burns without leaving any aſhes.

* *Kirwan.*

172 Elaſtic bitumen.

SPECIES 6. Elaſtic bitumen.

Mineral caoutchouc.

This ſubſtance was found about the year 1786 in the

(R) This name was given by Hauy from ανθραξ, *a coal.*

lead mine of Odin, near Caſtletown, Derbyſhire. It was firſt mentioned by Mr De Born.

Colour yellowiſh or reddiſh brown, ſometimes blackiſh brown. In its appearance it has a ſtrong reſemblance to caoutchouc or Indian rubber; hence its name. Conſiſtency various: ſometimes ſo ſoft as to adhere to the fingers; ſometimes nearly as hard as aſphalt. When ſoft it is elaſtic; when hard brittle. Sp. gr. 0.9053 to 1.0233 ‡.

‡ *Hatchett, ibid.*

Inſoluble in alcohol, ether, and oil of turpentine, but ſoluble in oil of olives. Not affected by nitric acid. When diſtilled, it yields a bituminous oil inſoluble in alcohol; the reſiduum is carbonaceous.*

* *Lametherie, Jour. de Phyſ.* xxxi. 312.

There is a variety of this ſubſtance found in a rivulet near the mine of Odin, which, when freſh cut, exactly reſembles fine cork in colour and texture; but in a few days after being expoſed to the air, becomes of a pale reddiſh brown. This ſubſtance contains within it a nucleus of elaſtic bitumen. It ſeems to be the elaſtic bitumen altered in its texture by the water †.

† *Hatchett, ibid.*

173
G. IV.
Coal.

Genus IV. COAL.

The ſubſtances belonging to this genus are compoſed of carbon or rather charcoal, and bitumen.

174
Jet.

SPECIES 1. Jet (s).

This ſubſtance is found in France, Spain, Germany, Britain, and other countries. It is found in detached kidneyform maſſes, of various ſizes, from an inch to ſeven or eight feet in length.

Colour full black. Luſtre 3 to 4; internal glaſſy. Opaque. Hardneſs 7 to 8. Not near ſo brittle as aſphalt. Texture ſtriated. Fracture conchoidal. Sp. gr. 1.259.* It has no odour except when heated, and then it reſembles the odour of aſphaltum. Melts in a ſtrong heat, burns with a greeniſh flame, and leaves an earthy reſiduum † Becomes ſomewhat electric by friction ‡. When diſtilled yields a peculiar acid §.

* *Briſſon.*

† *Hatchett.*

‡ *Kirwan.*

§ *Vauquelin.*

This mineral is formed into buttons, beads, and other trinkets. The manufacture has been almoſt confined to France ‖.

‖ *Jour. de Min.* N° iv. 41.

175
Cannel
coal.

SPECIES 2. Cannel coal.

This mineral is found in Lancaſhire, and in different parts of Scotland, where it is known by the name of *parrot coal.*

Colour black. Luſtre common, 2. Opaque. Structure ſometimes ſlaty. Texture compact. Fracture conchoidal. Hardneſs 5 to 8. Brittle. Sp. gr. 1.232 to 1.426. Does not ſtain the fingers.

Kindles eaſily, and burns with a bright white flame like a candle (T), which laſts but a ſhort time. It does not cake. It leaves a ſtony or ſooty reſiduum.

A ſpecimen of Lancaſhire cannel coal, analyſed by Mr Kirwan, contained 75.20 charcoal,
21.68 maltha,
3.10 alumina and ſilica.

99.98 †

† *Mineral.* ii. 523.

A ſpecimen of the ſlaty kind from Airſhire, called *ſplent coal,* was compoſed of
47.62 charcoal,
32.52 maltha,
20.00 earths.

100.14 ‡

‡ *Ibid.* 524.

Cannel coal is ſuſceptible of poliſh, and, like jet, is often wrought into trinkets.

176
Common
coal.

SPECIES 3. Common coal.

This very uſeful combuſtible is never found in the primitive mountains, but only in the ſecondary mountains, or in plains formed of the ſame materials with them. It is always in ſtrata, and generally alternates with clay, ſandſtone, or limeſtone.

Colour black, more or leſs perfect. Luſtre uſually greaſy or metallic, 2 to 4. Opaque. Structure generally ſlaty. Texture often foliated. Fracture various. Hardneſs 4 to 6. Sp. gr. 1.25 to 1.37. Uſually ſtains the fingers. Takes fire more ſlowly, and burns longer, than the laſt ſpecies. Cakes more or leſs during combuſtion.

Of this ſpecies there are many varieties, diſtinguiſhed in Britain by the names of caking coal, rock coal, &c. Theſe are too well known to require any deſcription.

Mr Kirwan analyſed a variety of different kinds of coal: The reſult of his experiments may be ſeen by the following table.

Whitehaven coal.	Wigan.	Swanſey.	Leeirim.	
57.0	61.73	73.53	71.43	charcoal.
41.3	36.7	23.14	23.37	maltha & aſph.
1.7	1.57	3.33	5.20	earths ‡.
100.0	100.00	100.00	100.00	

‡ *Mineral.* ii. 525.

177
Spurious
coal.

SPECIES 4. Spurious coal.

This mineral is generally found amidſt ſtrata of genuine coal. It is alſo called *parrot coal* in Scotland.

Colour greyiſh black. Luſtre 0 to 1. Structure uſually ſlaty. Texture earthy. Hardneſs 7 to 8. Sp. gr. 1.5 to 1.6. Generally explodes, and burſts when heated.

Compoſed of charcoal, maltha, and aſphalt, and above .20 of ſtony matter.

178
G. V. Amber.

Genus V. AMBER.

SPECIES 1. Common amber.

This ſubſtance, called *electrum* by the ancients, is found in different countries; but moſt abundantly in Pruſſia, either on the ſea ſhore, or under ground at the depth of about 100 feet, repoſing on *wood coal.** It is in lumps of different ſizes.

* *Kirw. Min.* ii. 66.

Colour yellow. Luſtre 3 to 2. Tranſparency 2 to 4. Fracture conchoidal. Hardneſs 5 to 6. Sp. gr. 1.078 to 1.085. Becomes electric by friction.

If a piece of amber be fixed upon the point of a knife, and then kindled, it burns to the end without melting †.

† *Hauy,*

By diſtillation it yields ſuccinic acid.

CLASS

(s) It was called *gagathes* by the ancients, from the river Gages in Licia, near which it was found; *jayet* in French, *ozabache* in Spaniſh, *gagath* in German.

(T) Hence it has been called *cannel coal. Candle,* in the Lancaſhire and Scotch dialect, is pronounced *cannel.*

CLASS IV. METALLIC ORES.

THIS claſs comprehends all the mineral bodies, compoſed either entirely of metals, or of which metals conſtitute the moſt conſiderable and important part. It is from the minerals belonging to this claſs that all metals are extracted; for this reaſon they have obtained the name of *ores*.

179 Orders. The metals hitherto diſcovered amount to 21; we ſhall therefore divide this claſs into 21 orders, allotting a diſtinct order for the ores of every particular metal.

Metals exiſt in ores in one or other of the four following ſtates. 1. In a metallic ſtate, and either ſolitary or combined with each other. 2. Combined with ſulphur. 3. In the ſtate of oxyds. 4. Combined with acids. Each order therefore may be divided into the four following genera.

180 Genera.

1. Alloys.
2. Sulphurets.
3. Oxyds.
4. Salts.

It muſt be obſerved, however, that every metal has not hitherto been found in all theſe four ſtates, and that ſome of them are hardly ſuſceptible of them all. Some of the orders therefore want one or more genera, as may be ſeen from the following table.

ORDER I. *Gold ores.*
  1. Alloys.
ORDER II. *Silver ores.*
  1. Alloys.
  2. Sulphurets.
  3. Oxyds.
  4. Salts.
ORDER III. *Platinum ores.*
  1. Alloys.
ORDER IV. *Ores of mercury.*
  1. Alloys.
  2. Sulphurets.
  3. Oxyds.
  4. Salts.
ORDER V. *Copper ores.*
  1. Alloys.
  2. Sulphurets.
  3. Oxyds.
  4. Salts.
ORDER VI. *Iron ores.*
  1. Alloys.
  2. Sulphurets.
  3. Carburets.
  4. Silicated iron.
  5. Oxyds.
  6. Salts.
ORDER VII. *Tin ores.*
  1. Sulphurets.
  2. Oxyds.
ORDER VIII. *Lead ores.*
  1. Sulphurets.
  2. Oxyds.
  3. Salts.
ORDER IX. *Zinc ores.*
  1. Sulphurets.
  2. Oxyds.
  3. Salts.
ORDER X. *Antimonial ores.*
  1. Alloys.
  2. Sulphurets.
  3. Oxyds.
  4. Salts.
ORDER XI. *Biſmuth ores.*
  1. Alloys.
  2. Sulphurets.
  3. Oxyds.
ORDER XII. *Arſenic ores.*
  1. Alloys.
  2. Sulphurets.
  3. Oxyds.
ORDER XIII. *Cobalt ores.*
  1. Alloys.
  2. Sulphurets.
  3. Oxyds.
  4. Salts.
ORDER XIV. *Nickel ores.*
  1. Sulphurets.
  2. Oxyds.
  3. Salts.
ORDER XV. *Mangancſe ores.*
  1. Oxyds.
  2. Salts.
ORDER XVI. *Tungſten ores.*
  1. Oxyds.
  2. Salts.
ORDER XVII. *Ores of molybdenum.*
  1. Sulphurets.
ORDER XVIII. *Ores of uranium.*
  1. Oxyds.
  2. Salts.
ORDER XIX. *Ores of titanium.*
  1. Oxyds.
ORDER XX. *Ores of tellurium.*
  1. Alloys.
ORDER XXI. *Ores of chromum.*
  1. Oxyds.

ORDER I. GOLD ORES.

181 Where found. No metal perhaps, if we except iron, is more widely ſcattered through the mineral kingdom than gold.* Hitherto it has been found only in a metallic ſtate; moſt commonly in grains, ramifications, leaves, or rhomboidal, octohedral, or pyramidal cryſtals. It is generally mixed with quartz, though there are inſtances of its having occurred in calcareous rocks. It is not uncommon alſo to find it diſſeminated through the ores of other metals: eſpecially iron, mercury, copper, and zinc. The greateſt quantity of gold is found in the warmer regions of the earth. It abounds in the ſands of many African rivers, and is very common in South America and India. Europe, however, is not deſtitute of this metal. Spain was famous in ancient times for its gold mines, and ſeveral of the rivers in France contain it in their ſands†. But the principal gold mines in Europe are thoſe of Hungary, and next to them thoſe of Salzburgh. Gold alſo has been diſcovered in Sweden and Norway, and more lately in the county of Wicklow in Ireland‡.

GENUS I. Alloys of gold.

SPECIES 1. Native gold.

182 G. I. Native gold. Native gold is never completely pure; it is alloyed with ſome ſilver or copper, and ſometimes with iron. In the native gold found in Ireland, indeed, the quantity of alloy appears to have been exceedingly ſmall.

Its colour is yellow. Luſtre metallic. Fracture hackly. Hardneſs 5. Sp. gr. from 12 to 19.

ORDER II. SILVER ORES.

183 Where found. SILVER is found moſt commonly in quartz, limeſtone, hornſtone; or combined with the ores of other metals, moſt commonly with copper, antimony, zinc, cobalt, and lead. This laſt metal indeed is ſeldom totally deſtitute of ſilver.

GENUS I. Alloys of ſilver.

184 G. I. Native ſilver.

SPECIES 1. Native ſilver.*

Native ſilver, ſo called becauſe the ſilver is nearly in a ſtate of purity, forms the principal part of ſome of the richeſt ſilver mines in the world. It is ſometimes in ſmall lumps; ſometimes cryſtallized in cubes, hexahedrons, octohedrons, or dodecahedrons; ſometimes in leaves, or threads, often ſo connected with each other as to reſemble branches of trees, and therefore called *dendrites*. The ſilver in the famous mines of Potoſi has this laſt form. When newly extracted, it is not unlike ſmall branches of fir†.

The colour of native ſilver is white; often tarniſhed. Luſtre metallic. Fracture hackly. Hardneſs 6. Malleable. Sp. gr. from 10 to 10.338.

This ſilver in this ſpecies is almoſt conſtantly alloyed with from .03 to .05 of ſome other metal, frequently gold or arſenic.

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* *Bergman.*

† *Reaumur, Mem. Par.* 1718, p. 68.

‡ *Loyd, Phil. Tranſ.* 1796, p. 36. *Mills, ibid.* p. 38.—*Nicholſon's Journ.* ii. 224.

* *Kirw.* ii. 108.—*Calling. Act. Liter. Sveciæ*, 1738, p. 420.

† *Bergman's Phyſ. Geogr. Jour. de Min.* N° xvi. p. 26.

185 Alloy of ſilver and gold.

SPECIES 2. Alloy of ſilver and gold.

Auriferous native ſilver.

This alloy is not uncommon in ſilver mines. Its colour is yellowiſh white. Its luſtre metallic. Hardneſs 5. Malleable. Sp. gr. above 10.6. Dr Fordyce found a ſpecimen from Norway compoſed of

72 ſilver,
28 gold.
100*

* *Phil. Tranſ.* 1776, p. 532.

186 Alloy of ſilver and antimony.

SPECIES 3. Alloy of ſilver and antimony†.

Antimoniated ſilver ore.

This alloy, which is found in the ſilver mines of Spain and Germany, is ſometimes in grains or lumps, and ſometimes cryſtallized in ſix-ſided priſms, whoſe ſides are longitudinally channelled‡.

Its colour is white. Its luſtre metallic. Hardneſs 10. Brittle. Sp. gr. from 9.4406§ to 10‖. Texture foliated. Fracture conchoidal. Before the blow-pipe the antimony evaporates in a grey ſmoke, and leaves a browniſh ſlag, which tinges borax green. If borax be uſed at firſt, a ſilver bead may be obtained.

This alloy was long ſuppoſed to contain arſenic. Bergman examined it, and found only ſilver and antimony¶. His analyſis has been confirmed by the experiments of Vauquelin and Selb*. According to Selb, it is compoſed of

89 ſilver,
11 antimony.
100

A ſpecimen, analyſed by Klaproth, contained

84 ſilver,
16 antimony.
100

Another ſpecimen contained

76 ſilver,
24 antimony.
100†

† *Kirwan*, ii. 110.
‡ *Romé de Liſle*, iii. 461.
§ *Hauy, Jour. de Min.* N° xxx. p. 473.
‖ *Kirwan, ibid.*
¶ *Opuſc.* ii. 415.
* *Jour. de Min. ibid.*
† *Beiträge*, ii. 301.

187 G. II. Sulphurets. Common ſulphuret of ſilver.

GENUS II. SULPHURETS OF SILVER.

SPECIES 1. Common ſulphuret of ſilver‡.

Vitreous ſilver ore.

This ore occurs in the ſilver mines of Germany and Hungary. It is ſometimes in maſſes, ſometimes in threads, and ſometimes cryſtallized. Its cryſtals are either cubes or regular octohedrons, whoſe angles and edges are often variouſly truncated. For a deſcription of the varieties produced by theſe truncatures, we refer the reader to *Romé de Liſle*¶.

Its colour is dark bluiſh grey, inclining to black; often tarniſhed. Internal luſtre metallic. Texture foliated. Fracture uneven. Hardneſs 4 to 5. May be cut with a knife like lead. Flexible and malleable. Sp. gr. 6.909* to 7.215†. In a gentle heat the ſulphur evaporates. Melts when heated to redneſs.

A ſpecimen of this ore, analyſed by Klaproth, contained

85 ſilver,
15 ſulphur.
100‡

‡ *Kirwan*, ii. 115.
¶ *Cryſtal.* iii. 441.
* *Briſſon.*
† *Gellert.*
‡ *Beiträge*, i. 162.

188 Antimoniated ſilver ore.

SPECIES 2. Antimoniated ſilver ore*.

Sulphuret of ſilver with antimony and iron.

This ore, which occurs in Saxony and Hungary, ſeems to be ſulphuret of ſilver contaminated with antimony and iron, and ought therefore, in all probability, to be conſidered merely as a variety of the laſt ſpecies. It is ſometimes in maſſes, but more frequently cryſtallized in ſix-ſided priſms, tables, or rhomboids; generally indiſtinct and accumulated together.

Its colour is iron grey; often tarniſhed. Its luſtre metallic. Fracture uneven. Hardneſs 4 to 5. Brittle. Sp. gr. 7.208†. Before the blow-pipe the ſulphur and antimony exhale, leaving a bead, which may be freed from iron by fuſion with nitre and borax.

A ſpecimen of this ore, analyſed by Klaproth, contained

66.5 ſilver,
12.0 ſulphur,
10.0 antimony,
5.0 iron,
1.0 ſilica,
0.5 arſenic and copper.
95.0‡

* *Kirwan*, ii. 118.
† *Gellert.*
‡ *Beiträge*, i. 166.

189 Sulphuret of ſilver and copper.

SPECIES 3. Sulphuret of ſilver and copper*.

Cupriferous ſulphurated ſilver ore.

This ore, which is found in the Korbolokinſk mountains in Siberia, was firſt deſcribed by Mr Renovantz. It is in amorphous maſſes, varying in ſize from that of the thumb to that of the fiſt.

Its colour is bluiſh grey like lead. Luſtre metallic. Hardneſs 5 to 6. Brittle. Its powder, when rubbed on the ſkin, gives it a black colour and a leaden gloſs. Before the blow-pipe the ſulphuret of ſilver melts readily; that of copper with difficulty. This ore is compoſed of about

42 ſilver,
21 copper,
35 ſulphur.
98

* *Kirwan*, ii. 121.

190 G. III. Oxyds. Calciform ſilver ore.

GENUS III. OXYDS OF SILVER.

SPECIES 1. Calciform ſilver ore†.

This ore was firſt deſcribed by Mr Widenman. It is ſometimes in maſſes, ſometimes diſſeminated through other minerals.

Its colour is greyiſh black. Its ſtreak bright. Its luſtre metallic. Its fracture uneven. Hardneſs 4 to 5. Brittle. Sp. gr. conſiderable. Effervefces with acids. Melts eaſily before the blow-pipe. Froths with borax.

According to Selb, it contains

72.5 ſilver,
15.5 copper,
12.0 carbonic acid.
100.0

† *Kirwan*, ii. 112.

191 Red ſilver ore.

SPECIES 2. Red ſilver ore (υ).

This ore is very common in ſeveral German ſilver mines. It occurs in maſſes, diſſeminated and cryſtallized. The primitive form of its cryſtals is a dodecahedron‡, whoſe ſides are equal rhombs, and which may be con-

‡ Fig. 38.

(υ) *Kirw.* II. 122.—*Scopoli de Minera Argenti Rubra.*—*Sage, Jour. de Phyſ.* XXXIV. 331. and XLI. 370; and *Nouv. Jour. de Phyſ.* II. 284.—*Weſtrum, Jour. de Phyſ.* XLIII. 291.—*Klaproth, Beiträge*, I. 141.

Silver.

conſidered as a ſix-ſided rhomboidal priſm, terminated by three-ſided ſummits*. Sometimes the priſm is lengthened, and ſometimes its edges, or thoſe of the terminating ſummits, or both, are wanting. For a deſcription and figure of theſe varieties, we refer to *De Liſle*† and *Hauy*‡.

* *Romé de Liſle*, iii. 447.
† *Ibid.*
‡ *Jour. d'Hiſt. Naturelle*, N° 18. p. 216.

Its colour is commonly red. Streak red. External luſtre metallic, internal common. Tranſparency from 3 to 1; ſometimes opaque. Fracture flat conchoidal. Hardneſs 5 to 7. Brittle. Sp. gr. from 5.44§ to 5.592¶. Becomes electric by friction, but only when inſulated‖. Soluble in nitric acid without effervеſcence*. Before the blow-pipe melts, blackens, burns with a blue flame, gives out a white ſmoke with a ſlight garlic ſmell, and leaves a ſilver bead†.

§ *Kirwan.*
¶ *Vauquelin, Jour. de Min.* N° xvii. p. 2.
‖ *Hauy, ibid.* N° xxx. p. 476.
* *Hauy, ibid.* N° xxxi. p. 518.
† *Vauquelin, ibid.*

Variety 1. Light red.

Colour intermediate between blood and cochineal red; ſometimes variegated. Streak orange red. Powder black.

Variety 2. Dark red.

Colour commonly between dark cochineal red and lead grey; ſometimes nearly black and without any ſhade of red. Streak dark crimſon red.

This ore was long ſuppoſed to contain arſenic, Klaproth firſt aſcertained its real compoſition‡; and his analyſis has been confirmed by Vauquelin, who found a ſpecimen compoſed of 56.6748 ſilver,
16.1300 antimony,
15.0666 ſulphur,
12.1286 oxygen.

100.

‡ *Ann. de Chim.* xviii. 81.

Klaproth proved, that the ſilver and antimony are in the ſtate of oxyds; and Vauquelin, that the ſulphur is combined partly with the oxyd of ſilver and partly with the oxyd of antimony. Klaproth obtained a little ſulphuric acid; but this acid, as Vauquelin, with his uſual ingenuity, demonſtrated, was formed during the analyſis.

This ore ſometimes contains a minute portion of arſenic, but never more than .02*.

* *Vauquelin, ibid.* p. 8.

192 G. IV. Salts. Muriat of ſilver.

GENUS IV. SALTS OF SILVER.

SPECIES 1. Muriat of ſilver (x).

Corneous ſilver ore.

This ore occurs at Johanngeorgenſtadt in Saxony, in South America, &c. It is often amorphous, ſometimes nearly in powder, and ſometimes cryſtallized in cubes or parallelopipeds.

Its colours are various: when expoſed to the light it becomes brown. Internal luſtre greaſy, 2; external, 2 to 1. Acquires a gloſs when ſcraped with a knife. Tranſparency 2 to 1. Texture foliated. Hardneſs 4 to 5. Sp. gr. 4.745* to 4.804†. Before the blowpipe it inſtantly melts, and gradually evaporates, but may be reduced by adding an alkali.

* *Briſſon.*
† *Gellert.*

Metallic ores.

That this ore contains muriatic acid, has been long known. Mr Woulfe firſt ſhewed that it contained alſo ſulphuric acid‡: and this diſcovery has been confirmed by Klaproth, according to whoſe analyſis this ore is compoſed of 67.75 oxyd of ſilver,
6.00 oxyd of iron,
21.00 muriatic acid,
.25 ſulphuric acid,
1.75 alumina.

96.75¶

‡ *Phil. Tranſ.* 1776.
¶ *Beiträge*, i. 134.

The alumina can only be conſidered as mixed with the ore. Sometimes its quantity amounts to .67 of the whole§.

§ *Ibid.* p. 137.

ORDER III. ORES OF PLATINUM (y).

193 Mines.

HITHERTO no mine of platinum has been diſcovered. It is found in ſmall ſcales or grains on the ſands of the river Pinto, and near Carthagena in South America. It is always in a metallic ſtate, and always combined with iron.

194 G. I. Alloys. Native platinum.

GENUS I. ALLOYS OF PLATINUM.

SPECIES 1. Native platinum.

Its colour is whitiſh iron grey. Magnetic. Sp. gr. from 12 to 16. Soluble in nitro-muriatic and oxymuriatic acids.

ORDER IV. ORES OF MERCURY.

MERCURY is employed in medicine; it ſerves to ſeparate ſilver and gold from their ores; the ſilvering of looking glaſſes, gilding, &c. are performed by means of it; and its ſulphuret forms a beautiful paint.

195 Mines.

Mercury abounds in Europe, particularly in Spain, Germany, and Hungary: it is found alſo in China (z), the Philippines*, and in Peru, and perhaps Chili (A) in South America. The moſt productive mines of mercury are thoſe of Idria†; of Almaden, near Cordova in Spain, which were wrought by the Romans (B); of the Palatinate‡; and of Guanca Velica in Peru (C).

* *Carreri's Voyage.*
† *Scopoli, Jour. de Min.* N° xxxvi. p. 915.
‡ *Jour. de Min.* N° vi. and vii.

Mercury has never been found in Britain, nor has any mine worth working been diſcovered in France. It occurs moſt commonly in argillaceous ſhiſtus, limeſtones, and ſandſtones.

196 G. I. Alloys. Native mercury.

GENUS I. ALLOYS OF MERCURY.

SPECIES 1. Native mercury.

Native mercury is found in moſt mercurial mines: it is in ſmall globules, ſcattered through different kinds of ſtones, clays, and ores.

Fluid. Colour white. Sp. gr. about 13.6.

SPECIES

(x) *Kirw.* II. 113.—*Laxmann. Nov. Comm. Petropol.* XIX. 482.—*Monnet. Mem. Sçav. Etrang.* IX. 717.

(y) See *Brownrigg, Phil. Tranſ.* XLVI. 584.—*Lewis, ibid.* XLVIII. 638. and L. 148.—*Margraf. Mem. Berlin*, 1757, p. 314.—*Macquer, Mem. Par.* 1758, p. 119.—*Buffon, Jour. de Phyſ.* III. 324.—*Morveau, ibid.* VI. 193.—*Bergman, Opuſc.* II. 166.—*Tillet, Mem. Par.* 1779, p. 373, and 383, and 545.—*Crell, Crell's Annals*, 1784, 1 *Band.* 328.—*Willis, Mancheſter Memoirs*, III. 467.—*Muſſin Puſchkin, Ann. de Chim.* XXIV. 205.—*Morveau, ibid.* XXV. 3.

(z) See *Entrecolle's Lettres Edificantes.*

(A) See *Molina's Natural Hiſtory of Chili.*

(B) See *Bowle's Natural Hiſtory of Spain*, and *Jour. de Min.* N° xxxi. p. 555.

(C) See *Ulloa's Memoirs concerning America.*

197 Amalgam of ſilver.

SPECIES 2. Amalgam of ſilver.*

Native amalgam.

This mineral has been found in the ſilver mine of Sahlberg †, in the province of Dalecarlia, in Sweden; in the mines of Deux Ponts ‡, in the Palatinate; and in other places. It is in thin plates, or grains, or cryſtallized in cubes, parallelopipeds, or pyramids.

Its colour is ſilvery white or grey. Luſtre metallic. Creaks when cut. Sp. gr. above 10. Tinges gold white. Before the blow-pipe the mercury evaporates and leaves the ſilver.

A ſpecimen of this amalgam, analyſed by Klaproth, contained

64	mercury,
36	ſilver.
100 §	

Sometimes it contains a mixture of alumina, and ſometimes the proportion of mercury is ſo great that the amalgam is nearly as ſoft as paſte.

* *Kirwan*, ii. 223.
† *Cronſtedt's Min.*
‡ *Heyer. Crell's Annals*, 1790.
§ *Beiträge*, i. 183.

198 G. II. Sulphurets. Common ſulphuret.

GENUS II. SULPHURETS OF MERCURY.

SPECIES 1. Common ſulphuret.*

Native cinnabar.

This ore, which is found in almoſt all mercurial mines, is ſometimes in veins, ſometimes diſſeminated, ſometimes in grains, and ſometimes cryſtallized. The form of its cryſtals is a tetrahedron or three-ſided pyramid, moſt commonly wanting the ſummit; ſometimes two of theſe pyramids are joined baſe to baſe: and ſometimes there is a three-ſided priſm interpoſed between them †.

Its colour is red. Its ſtreak red and metallic. Luſtre when cryſtallized 2 to 3; when amorphous, often 0. Tranſparency, when cryſtallized, from 1 to 3; when amorphous, often 0. Texture generally foliated. Hardneſs from 3 to 8. Sp. gr. from 5.419 to 10.1285.

Before the blow-pipe evaporates with a blue flame and ſulphureous ſmell. Inſoluble in nitric acid ‡.

Variety. 1. Dark red.

Colour cochineal red. Hardneſs 6 to 7. Sp. gr. when pure, 10.1285 §; ſometimes only 7.2, or even 6.188 ¶.

Variety 2. Bright red.

Colour commonly ſcarlet. Sp. gr. 6.9022 † to 5.419 ‡.

* *Kirwan*, ii. 228.
† *Romé de Liſle*, iii. 154.
‡ *Hauy, Jour. de Min.* Nº xxxi. p. 518.
§ *Briſſon.*
¶ *Muſchenbroek.*
† *Briſſon.*
‡ *Gellert.*

199 G. III. Oxyds. Hepatic mercurial ore.

GENUS III. OXYDS OF MERCURY.

SPECIES 1. Hepatic mercurial ore.*

This ore, which is the moſt common in the mines of Idria, is always amorphous, and is often mixed with native mercury and cinnabar.

Its colour is ſomewhat red. Its ſtreak dark red and brighter. Luſtre commonly metallic. Hardneſs from 6 to 8. Sp. gr. from 9.2301 † to 7.186 ‡. When heated the mercury evaporates.

Though this ore has never been accurately analyſed, chemiſts have concluded that the mercury which it contains is in the ſtate of a red oxyd, becauſe it is inſoluble in nitric and ſoluble in muriatic acid ¶. When pureſt, it contains about .77 of mercury §. It contains alſo ſome ſulphur and iron.

Werner has divided this ſpecies into two varieties, the *compact* and the *ſlaty*. The ſecond is often nothing more than bituminous ſhale impregnated with oxyd of mercury †.

* *Kirwan.* ii. 224.
† *Briſſon.*
‡ *Kirwan.*
¶ *Sage, Jour. de Phyſ.* xxiv. 61.
§ *Scopoli, Jour. de Min.* Nº xxxvi. p. 919.
† *Kirwan*, ii. 226.

200 Mercurial Salts. Muriat of mercury.

GENUS IV. MERCURIAL SALTS.

SPECIES 1. Muriat of mercury.*

Corneous mercury.

This ore, which occurs in the Palatinate, is ſometimes in ſcales, ſometimes in grains, and ſometimes cryſtallized. Its cryſtals are either ſmall four or ſix-ſided priſms whoſe ſides are rhombs †, or cubes, or four-ſided pyramids wanting their angles. They are always very ſmall and generally confuſed.

Its colours are various; but it is moſt frequently white. Its luſtre, when white, is pearly. Sometimes opaque, and ſometimes ſemitranſparent. Evaporates before the blow pipe.

Mr Woulfe diſcovered, that this ore generally contains ſome ſulphuric acid ‡. Specimens have been found in which the quantity of ſulphuric acid exceeds that of the muriatic §.

* *Kirwan*, ii. 226.
† *Romé de Liſle*, iii. 161.
‡ *Phil. Tranſ.* lxvi. 618.
§ *Suckow.*

ORDER V. COPPER ORES.

MANY of the moſt uſeful utenſils are formed of copper: it enters largely into the compoſition of braſs, bronze, and bell metal; not to mention the dyes and paints of which it is the baſis.

201 Mines.

Copper mines abound in moſt countries. They are wrought in China, Japan, Sumatra; the north of Africa; in Chili and Mexico; and in moſt parts of Europe; eſpecially Britain, Germany, Ruſſia, Hungary.

Copper is found moſt commonly in rocks of hornblende, ſhiſtus, and quartz.

202 G. I. Alloys. Native copper.

GENUS I. ALLOYS OF COPPER.

SPECIES 1. Native copper.*

Native copper occurs now and then in the greater number of copper mines: Sometimes it is in maſſes, ſometimes in plates and threads, which aſſume a variety of forms; and ſometimes, as in Siberia, it is cryſtallized in cubes, or other forms nearly reſembling cubes †.

Colour commonly that of copper, but ſometimes dark brown. Luſtre metallic. Streak brighter. Fracture hackley. Flexible and malleable. Hardneſs 6 to 7. Sp. gr. from 7.6 ‡ to 8.5844 ¶.

* *Kirwan*, ii. 127.—*Cartheuſer.*
† *Houy, Jour. de Min.* Nº xxxi. 509.
‡ *Kirwan's Min.* ii. 128.
¶ *Hauy, ibid.* p. 509.

203 White copper ore.

SPECIES 2. White copper ore §.

Alloy of copper, iron, and arſenic.

This ore, which is ſaid to be uncommon, occurs in maſſes. Colour white. Luſtre metallic. Fracture uneven. Hardneſs 8 to 9. Brittle. Sp. gr. conſiderable.

Before the blow-pipe gives out a white arſenical ſmoke, and melts into a greyiſh black ſlag.*

§ *Kir. Min.* ii. 152.
* *Widenman.*

204 G. II. Sulphurets of copper. Common ſulphuret of copper.

GENUS II. SULPHURETS OF COPPER.

SPECIES 1. Common ſulphuret of copper †.

Vitreous copper ore.

This ore, which is found in Cornwal, Hungary, and Siberia, occurs in maſſes, plates, threads, and cryſtallized in ſix-ſided priſms, or four-ſided pyramids, joined baſe to baſe.

Colour bluiſh grey. Streak brighter grey. Luſtre metallic. Hardneſs 4 to 7. Sp. gr. 5.452 ‡ to 5.565 §; ſometimes ſo low as 4.129.* Detonates with nitre.

Before the blow-pipe it melts eaſily; and while in fuſion exhibits a green pearl, which, on cooling, is covered with a brown cruſt. Tinges borax green.

Werner makes two varieties of this ore: the firſt he calls

† *Kirwan*, ii. 144.
‡ *Kirwan.*
§ *Gellert.*
* *Kirwan.*

calls *compact*, from its fracture; and the ſecond, for the ſame reaſon, he calls *foliated*. This laſt is ſomewhat darker coloured than the firſt, but in other reſpects they agree.

205
Copper pyrites.

SPECIES 2. Copper pyrites.*

Yellow copper ore.

This ore, which is probably nothing elſe than ſulphuret of iron combined with copper, and which, therefore, would be more properly placed among iron ores, is found frequently in copper mines, and mixed with common pyrites or ſulphuret of iron. It is ſometimes amorphous, and ſometimes cryſtallized. Its cryſtals are either three or four-ſided pyramids applied baſe to baſe, or ſix-ſided plates.

Its colour is yellow; often tarniſhed. Its internal luſtre metallic. Hardneſs 6 to 7; ſometimes 9. Brittle. Sp. gr. 4.314 † to 4.08 ‡. Deflagrates; but does not detonate with nitre ‖.

Before the blow-pipe decrepitates, gives a greeniſh ſulphureous ſmoke, and melts into a black maſs, which tinges borax green. Does not efferveſce with nitric acid.

206
Purple copper ore.

SPECIES 3. Purple copper ore.*

This ore is found in maſſes, or plates, or diſſeminated; ſometimes, alſo, it is cryſtallized in octohedrons. Colour various, but moſt commonly purple; internally reddiſh. Streak reddiſh and bright. Luſtre metallic. Hardneſs 6 to 7. Brittle. Sp. gr. 4.956 to 4.983 †.

Efferveſces with nitric acid, and tinges it green. Deflagrates with nitre. Before the blow-pipe melts readily, without ſmoke, vapour, or ſmell; but is not reduced. Tinges borax a bright green.

A ſpecimen of this ore, analyſed by Klaproth, contained

58 copper,
18 iron,
19 ſulphur,
5 oxygen.

100 ‡

207
Grey copper ore.

SPECIES 4. Grey copper ore §.

This ore is found in Cornwal, Saxony, Hungary, &c. It is often amorphous, but often alſo cryſtallized. The primitive form of its cryſtals is the regular tetrahedron; but, in general either the angles or the edges, or both, are truncated or bevelled ‖.

Colour ſteel grey; often tarniſhed, and then dark grey. Streak dark grey; ſometimes reddiſh brown. Powder blackiſh; ſometimes with a tint of red. Luſtre metallic. Hardneſs 7 or 8. Very brittle. Sp. gr. 4.8648.* Deflagrates with nitre. Before the blow-pipe crackles, but at laſt melts, eſpecially if aſſiſted by borax. The bead gives a white ſmoke, without any particular ſmell; tinges borax yellow or browniſh red, but does not unite with it.

A ſpecimen of this ore from Cremnitz, analyſed by Klaproth, contained

31 copper,
14 ſilver,
34 antimony,
3 iron,
11 ſulphur.

93

* Kirwan, ii. 140.
† Briſſon.
‡ Kirwan.
‖ Id. Min. ii. 141.
* Kirwan, ii. 142.
† Ibid. ii. 143.
‡ Beitrage, ii. 286.
§ Kirwan, ii. 146.
‖ Romé de Liſle, iii. 315.
* Hauy, Jour. de Min. N° xxxi. 512.

Napion, in an ore from the valley of Lanzo, found copper, ſilver, and antimony, nearly in the ſame proportions, but more iron, and ſome arſenic †. Savoreſi, as Baron Born informs us, beſides the ingredients of Klaproth's analyſis, found ſome gold and mercury in grey copper ore ‡: and Klaproth himſelf found lead in moſt of the other ſpecimens which he examined.

† Mem. Turin, v. 173.
‡ Catal. ii. 498.

208
G. III.
Oxyds.
Red oxyd of copper.

GENUS III. OXYDS OF COPPER.

SPECIES 1. Red oxyd of copper §.

Florid red copper ore—Red copper glaſs.

This ore is found in Cornwal, and many other countries. It occurs in maſſes, diſſeminated, in ſcales, and cryſtallized. The figure of its cryſtals is moſt commonly the regular octohedron.*

Colour commonly cochineal red. Streak brick red. Luſtre ſemimetallic. Tranſparency, when amorphous, generally 0; when cryſtallized, 3 or 4. Hardneſs from 4 to 7. Soluble with efferveſcence in nitric acid. Before the blow pipe melts eaſily, and is reduced.

This ore was ſuppoſed to be compoſed of carbonic acid and red oxyd of copper; but a ſpecimen, examined by Vauquelin, which conſiſted of pure cryſtals, contained no acid †. It muſt therefore be conſidered as an oxyd of copper.

Werner has made three varieties of this ore, which, from their texture, he has denominated *compact*, *foliated*, and *fibrous*. The firſt is ſeldom or never found cryſtallized, and is opaque; the ſecond occurs amorphous, cryſtallized, and in ſcales; the third is carmine, ruby, or ſcarlet red; and occurs always in ſhort capillary cryſtals, or delicate flakes.

This ore ſometimes contains a mixture of red oxyd of iron; it is then called *brick red copper ore, copper malm, or copper ochre.*

This ore is ſometimes mixed with bitumen. Its colour is then browniſh black, and it is called *pitch ore.*

§ Kirwan, ii. 135.
* Hauy, Jour. de Min. N° xxxi. 517.
† Ibid.

209
Green oxyd of copper.

SPECIES 3. Green oxyd of copper §.

Green ſand of Peru.

This ore, which was brought from Peru by Dombey, is a graſs green powder, mixed with grains of quartz. When thrown on burning coals, it communicates a green colour to the flame. It is ſoluble both in nitric and muriatic acids without efferveſcence. The ſolution is green. It was ſuppoſed to contain muriatic acid;* but Vauquelin has diſcovered, that the appearance of this acid was owing to the preſence of ſome common ſalt, which is accidently mixed with the ſand ‡.

§ Kirwan, ii. 149.
* Berthollet, Mem. Par. 1786, 462.
‡ Jour. de Min. N° xxxi. 519.

210
G. IV.
Salts.
Blue carbonat of copper.

GENUS IV. SALTS OF COPPER.

SPECIES 1. Blue carbonat of copper (D).

Mountain blue—Azur de cuivre—Blue calx of copper—Kupfer lazur.

This ore, which occurs in the copper mines of Siberia, Sweden, Germany, Hungary, Cornwal, &c. is either amorphous or cryſtallized. The cryſtals are ſmall, and difficult to examine. According to Romé de Liſle, their primitive form is an octohedron, the ſides of which are iſoſceles triangles, and two of them more inclined than the others §. Be that as it may, the cryſtals of blue carbonat of copper are often rhomboidal priſms, either regular, or terminated by dihedral ſummits.*

Its colour is azure or ſmalt blue. Streak blue. Hardneſs

§ Cryſtal. iii. 343.
* Ibid. p. 345.

(D) *Kirw.* II. 129.—*Morveau, Mem. Dijon*, 1782. 1 *Semeſtre*, p. 100.

neſs 4 to 6. Brittle. Sp. gr. 3.608 ‡. It effervesces with nitric acid, and gives it a blue colour. Before the blow-pipe it blackens, but does not melt. Tinges borax green with effervescences.

‡ *Briſſon.*

The cryſtals, according to Pelletier, are compoſed of

66 to 70 copper,
18 — 20 carbonic acid,
8 — 10 oxygen,
2 — 2 water.

Fontana firſt diſcovered that this ore contained carbonic acid gas.

Variety 1. Earthy blue carbonat.

Mountain blue.

This variety generally contains a mixture of lime. It is never cryſtallized; and ſometimes is almoſt in the ſtate of powder. Luſtre 0. Texture earthy.

Variety 2. Striated blue carbonat of copper.

Luſtre glaſſy. Tranſparency, when cryſtallized, 2; when amorphous, 1. Texture ſtriated; ſometimes approaching to the foliated.

211 Green carbonat of copper.

SPECIES 2. Green carbonat of copper (E).

Oxygenated carbonat of copper—Malachite.

This ore is generally amorphous, but ſometimes it is cryſtallized in four-ſided priſms, terminated by four-ſided pyramids.

Colour green. Luſtre ſilky. Hardneſs 5 to 7. Brittle. Sp. gr. 3.571* to 3.653 ‡. Effervesces with nitric acid, and gives a blue colour to ammonia. Before the blow-pipe it decrepitates and blackens, but does not melt. Tinges borax yellowiſh green. It is compoſed of carbonic acid and green oxyd of iron.

* *Briſſon.*
‡ *Kirwan.*

Variety 1. Fibrous malachite.

Texture fibrous. Opaque when amorphous; when cryſtallized its tranſparency is 2. Colour generally graſs green.

Variety 2. Compact malachite.

Texture compact. Opaque. Colour varies from the dark emerald green to blackiſh green.

A ſpecimen of malachite from Siberia, analyſed by Klaproth, contained

58.0 copper,
18.0 carbonic acid,
12.5 oxygen,
11.5 water.

100 *

* *Beiträge,* ii. 290.

This ſpecies is ſometimes mixed with clay, chalk, and gypſum, in various proportions; it is then known by the name of

Common mountain green.

Its colour is verdigris green. Luſtre 0. Tranſparency 0 to 1. Hardneſs 3 to 4. Brittle. Texture earthy. Effervesces feebly with acids. Before the blow-pipe it exhibits the ſame phenomena with malachite.

212 Sulphat of copper.

SPECIES 3. Sulphat of copper.

For a deſcription of this ſalt, ſee CHEMISTRY, n° 648. in this *Supplement.*

213 Arſeniat of copper.

SPECIES 4. Arſeniat of copper ‡.

‡ *Kirwan,* ii. 151.

Olive copper ore.

This ore is found at Carrarach in Cornwal. It is generally cryſtallized in ſix-ſided compreſſed priſms. Its colour is olive green. Streak ſometimes ſtraw coloured, ſometimes olive green. Luſtre glaſſy. Tranſparency from 4 to 2. Fracture conchoidal. Hardneſs 4 to 7. Before the blow-pipe deflagrates with an arſenical ſmoke, and melts into a grey coloured bead. This bead, fuſed with borax, leaves a button of pure copper ||.

|| *Klaproth's Obſervations on Cornwal,* p. 29.

Klaproth diſcovered that it was compoſed of oxyd of copper and arſenic acid.

Sometimes this ore is combined with iron. It then cryſtallizes in cubes. Theſe cubes are of a dark green colour; before the blow-pipe they froth, give out an arſenical ſmoke, and do not ſo quickly form a grey bead as the arſeniat of copper.*

* *Ibid.* p. 29.

ORDER VI. IRON ORES.

To deſcribe the uſes of iron, would be to write the hiſtory of every art and manufacture, ſince there is not one which is not more or leſs dependent upon this uſeful metal. Nor is its abundance inferior to its utility. It exiſts almoſt everywhere, and ſeems, as it were, the bond which connects the mineral kingdom together.

214 Mines.

215 G. I. Alloys. Native iron.

GENUS I. ALLOYS OF IRON.

SPECIES 1. Native iron (F).

Native iron has been found in Siberia and in Peru in immenſe maſſes, which ſeemed as if they had been fuſed. Theſe maſſes evidently did not originate in the place where they were found. See *FIRE-BALLS, Suppl.*

Colour bluiſh white. Fracture hackly. Luſtre metallic. Malleable. Magnetic. Hardneſs 8 to 9. Sp. gr. 7.8. Prouſt has diſcovered, that the native iron found in Peru is alloyed with nickel ¶.

¶ *Nicholſon's Jour.* iii. 374.

216 G. II. Sulphurets. Common ſulphuret of iron.

GENUS II. SULPHURETS OF IRON.

SPECIES 1. Common ſulphuret of iron.*

Pyrites.

This mineral occurs very frequently both in ores and mixed with other bodies, for inſtance in ſlates. It is often amorphous, and often alſo cryſtallized. The primitive form of its cryſtals is either a regular cube or an octohedron. The varieties of its form hitherto deſcribed amount to 30; for a deſcription of which we refer the reader to *Romé de Liſle* †.

* *Kirwan,* ii. 76.—*Henkel's Pyritologia.*
† *Cryſtal.* iii. 208.

Its colour is yellow. Its luſtre metallic. Hardneſs 8 to 10. Brittle. Sp. gr. 3.44 to 4.6. Soluble in nitric acid with effervescence. Scarce ſoluble in ſulphuric acid. Before the blow-pipe burns with a blue flame and a ſulphureous ſmell, and leaves a browniſh bead, which tinges borax of a ſmutty green.

Variety 1. Common pyrites.

Fracture uneven. Hardneſs 10. Decrepitates when heated. Emits a ſulphureous ſmell when rubbed. Not magnetic. It occurs often in coal mines and in ſlates.

Variety 2. Striated pyrites.

Texture ſtriated. Hardneſs 10. Not magnetic.

Variety 3. Capillary.

Colour often ſteel grey. Found in needle-form cryſtals. Uncommon. Not magnetic.

Variety 4. Magnetic pyrites.

Found in maſſes. Texture compact. Hardneſs 8, 9. Slightly magnetic. Seems to contain leſs ſulphur than the other varieties.

In pyrites the proportion of the ſulphur to the iron is variable, and this explains the variety of its cryſtalline forms.

GENUS

(E) *Kirw.* II. 131.—*Fontana, Jour. de Phyſ.* XI. 509.—*Klaproth, Beiträge,* II. 287.

(F) *Pallas, Phil. Tranſ.* LXVI. 523.—*Rubin de Celis, ibid.* LXXVIII. 37.—See alſo *Schreiber, Jour. de Phyſ.* XLI. 3.; and *Stelin, Phil. Tranſ.* LXIV. 461.

Iron Ores.

217
G. III.
Plumbago.

Genus III. carburet of iron.

species 1. Plumbago.*

Graphite of Werner.

This mineral is found in England, Germany, France, Spain, America, &c. It occurs in kidney-form lumps of various ſizes. Its colour is dark iron grey or browniſh black; when cut, bluiſh grey. Luſtre metallic, from 3 to 4. Opaque. Structure ſlaty. Texture fine grained. Hardneſs 4 to 5. Brittle. Sp. gr. from 1.987 to 2.089; after being ſoaked in water 2.15; after being heated 2.3, and when heated after that 2.41 †. Feels ſomewhat greaſy. Stains the fingers, and marks ſtrongly. The uſe of this mineral when manufactured into pencils is known to every perſon.

Its compoſition was diſcovered by Scheele. When pure it contains
90 carbon,
10 iron.

100

But it is often exceedingly impure: A ſpecimen, for inſtance, from the mine of Pluffier, in France, analyſed by Vauquelin, contained
23 carbon,
2 iron,
38 ſilica,
37 alumina.

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100 ‡

[*] *Kirwan*, ii. 58.

[†] *Briſſon.*

[‡] *Jour. de Min.* N° xii. p. 16.

218
G. IV.
Emery.

Genus IV. iron combined with silica.

species 1. Emery.*

This mineral is commonly diſſeminated through other foſſils, but ſometimes in the Eaſt Indies it occurs in large maſſes.

Its colour is bluiſh grey, greyiſh brown, or bluiſh black, often covered with a yellowiſh rind; internally it diſcovers red or purple ſpots. Luſtre 1 or 0; in ſome parts 2, and metallic. Opaque. Hardneſs 14. Brittle. Sp. gr. 3.92 †. Before the blow-pipe it blackens and gives a ſmutty yellow tinge to borax.

According to Wiegleb it contains
95.6 ſilica,
4.3 iron.

99.9

[*] *Kirwan*, ii. 193.

[†] *Briſſon.*

219
G. V.
Oxyds.

Genus V. oxyds of iron.

This genus is very extenſive; for iron is much more frequently found in the ſtate of an oxyd than in any other.

220
Black oxyd of iron.

species 1. Black oxyd of iron ‡.

Common magnetic iron ſtone—Blackiſh octohedral iron ore.

This ſpecies of ore is very common in Sweden; it is found alſo in Switzerland, Norway, Ruſſia, &c. It occurs in maſſes, plates, grains, and cryſtallized. The primitive form of its cryſtals is a regular octohedron †. Sometimes two oppoſite ſides of the pyramids are trapeziums, which renders the apex of the pyramids cuneiform. Sometimes the cryſtals paſs into rhomboidal parallelepipeds, and into dodecahedrons with rhomboidal faces §.

Its ſurface is browniſh black; internally bluiſh grey. Powder black.* Streak blackiſh grey, brighter. Luſtre metallic. Hardneſs 9 to 10. Brittle. Sp. gr. from 4.094 to 4.688 †. Attracted by the magnet, and generally poſſeſſed of more or leſs magnetic virtue ‡. To this ſpecies belongs the magnet. Before the blow-pipe it becomes browner, but does not melt. Tinges borax dark green.

[‡] *Kirwan*, ii. 158.

[†] *Romé de Liſle*, iii. 1?8.

[§] *Ibid.*

[*] *Hauy, Jour. de Min.* N° xxxiii. 659.

[*] *Kirwan's Min.* ii. 1?9.

[†] *Hauy, Jour. de Min.* N° xxxiii. 527.

Metallic Ores.

When pure it conſiſts entirely of oxyd of iron; and this oxyd appears to contain from .15 to .24 oxygen, and from .76 to .85 iron §. Undoubtedly it conſiſts of a mixture of iron in two different ſtates of oxydation. It is often alſo mixed and contaminated with foreign ingredients.

There are two varieties of this ore. The firſt is what we have juſt deſcribed; the ſecond is in the form of ſand and has therefore been called

Magnetic ſand.*

This ſubſtance is found in Italy, Virginia, St Domingo, the Eaſt Indies, and in the ſand of the river Don at Aberdeen in Scotland. It is black, very hard, magnetic. Sp. gr. about 4.6. Not altered by the blow-pipe *per ſe*; melts into a black glaſs with potaſs, and into a green glaſs with microcoſmic ſalt, both opaque †. It probably contains ſome ſilica, as Kirwan has ſuppoſed ‡.

[§] *Kirwan's Min.* ii. 159.

[*] *Kirwan*, ii.—*Dupuget, Jour. de Min.* N° xxi. p. 75.

[†] *Fourcroy, Ann. de Chim.* ii. 127.

[‡] *Min.* ii. 161.

221
Specular iron ore.

species 2. Specular iron ore ¶.

Fer oligiſte.

This ore is found abundantly in the iſle of Elba near Tuſcany. It is either in maſſes or cryſtallized. The primitive form of its cryſtals, and of its integrant molecules, is the cube.* The varieties hitherto obſerved amount to 7. Theſe are the rhomboidal parallelopiped; the cube, with three triangular faces inſtead of two of its angles diagonally oppoſite; two ſix-ſided pyramids, applied baſe to baſe, wanting the ſummits ‡, and ſometimes the angles at the baſes, and ſometimes the alternate edges of the pyramid; a polyhedron of 24 ſides, reſembling a cube with three triangular faces for two angles diagonally oppoſite, and two triangles for the reſt of its angles. For a deſcription and figure of theſe varieties, we refer to *Romé de Liſle* † and *Hauy* ‡.

Colour ſteel grey: often tarniſhed, and beautifully irideſcent, reflecting yellow, blue, red. Streak red. Powder dark red. Luſtre metallic. Hardneſs 9 to 10. Not brittle. Sp. gr. 5.0116 † to 5.218 ‡. Slightly magnetic. Little altered by the blow-pipe. Tinges borax an obſcure yellow.

This ore, according to Mr Muſhet, is compoſed of
66.1 iron,
21.2 oxygen,
10.7 water and carbonic acid,
2.0 lime.

100.0 †

The quantity of oxygen here ſtated is probably too ſmall, owing to the unavoidable inaccuracy which reſults from the *dry way* of analyſis which Mr Muſhet followed.

[¶] *Kirw* ii. 162.—*Coudrai, Jour. de Phyſ.* iv. 52.

[*] *Hauy, Jour. de Min.* N° xxxiii. 660.

[‡] Fig. 39.

[†] *Cryſt.* iii. 189.

[‡] *Ibid.* 660.

[†] *Hauy.*

[‡] *Briſſon.*

[†] *Philoſ. Mag.* iii. 354.

Micaceous iron ore

Is generally conſidered as a variety of this ſpecies. Kirwan, however, ſuppoſes it to contain carbon, and to be a diſtinct ſpecies.

It is found in Saxony, and in the iſle of Elba, &c. generally in amorphous maſſes, compoſed of thin ſix-ſided laminæ. Colour iron grey. Streak bluiſh grey. Luſtre metallic. Opaque. Feel greaſy. Hardneſs 5 to 7. Brittle. Sp. gr. from 4.5 to 5.07. Slightly magnetic. Infuſible by the blow-pipe. Tinges borax greeniſh brown.

222 Laminated ſpecular iron ore.

SPECIES 3. Laminated ſpecular iron ore.

Fer pyrocete of Hauy.

This ore, which is found at Mont d'or in Auvergne, was uſually arranged under the laſt ſpecies; but has been ſeparated from it, we think properly, by Mr Hauy, becauſe the form of its cryſtals is incompatible with the ſuppoſition that their primitive nucleus is a cube, as we have ſeen is the caſe with common ſpecular iron ore. Its cryſtals are thin octagonal plates, bounded by ſix linear trapeziums, alternately inclined different ways †.

Colour ſteel grey. Powder reddiſh black. Luſtre metallic; ſurface poliſhed. Fracture glaſſy. Very brittle ‡. Hauy ſuppoſes that this ore has been produced by fire, and accordingly has given it a name which denotes its origin.

223 Brown iron ore.

SPECIES 4. Brown iron ore ¶.

This ſpecies of ore is found abundantly in Britain, particularly in Cumberland and Lancaſhire; and it is alſo very common in other counties. It conſiſts of the brown oxyd of iron, more or leſs contaminated with other ingredients.

Its colour is brown. Its ſtreak reddiſh brown. Sp. gr. from 3.4771 to 3.951. Before the blow-pipe blackens, but does not melt. Tinges borax greeniſh yellow.

Variety 1. Brown hæmatites.

The name hæmatites (bloodſtone) was probably applied by the ancients only to thoſe ores which are of a red colour, and have ſome reſemblance to clotted blood; but by the moderns it is applied to all the ores of iron which give a reddiſh coloured powder, provided they be of a fibrous texture.

Brown hæmatites occurs in maſſes of various ſhapes, and it is ſaid alſo to have been found cryſtallized in five or ſix-ſided acute angled pyramids. Colour of the ſurface brown or black, ſometimes irideſcent; internally nut brown. Powder red. Texture fibrous. Hardneſs 8 to 10. Brittle. Sp. gr. 3.789 † to 3.951 ‡. Not magnetic.

This variety has not been analyſed, but it ſeems to conſiſt of brown oxyd of iron, oxyd of manganeſe, and alumina ¶.

Variety 2. Compact brown iron ſtone.

This variety occurs in maſſes of very various and often fantaſtical ſhapes.

Colour brown. Internal luſtre metallic. Texture compact. Hardneſs 6 to 9. Brittle. Sp. gr. 3.4771 † to 3.551 ‡.

Variety 3. Brown ſcaly iron ore.

This variety is generally incumbent on other minerals. Colour brown. Luſtre metallic. Stains the fingers, marks ſtrongly. Feels unctuous. Texture foliated. Hardneſs 3 to 5. Brittle. So light as often to float on water.

Variety 4. Brown iron ochre.

This variety occurs both maſſive and diſſeminated. Colour from nut brown to orange. Luſtre 0. Strongly ſtains the fingers. Texture earthy. Hardneſs 3 to 4. When ſlightly heated reddens.

224 Red iron ore.

SPECIES 5. Red iron ore†.

Colour red. Streak blood red. Sp. gr. from 3.423 to 5.005. Before the blow-pipe blackens, but does not melt. Tinges borax yellowiſh olive green. When digeſted in ammonia, it becomes black and often magnetic.

Variety 1. Red hæmatites.

Found in maſſes, and all the variety of forms of ſtalactites. Colour between browniſh red and ſteel grey. Powder red. Internal luſtre metallic. Texture fibrous. Hardneſs 9 to 10. Brittle. Sp. gr. 4.74 † to 5.005 ‡.

When pure it conſiſts of red oxyd of iron, but it often contains manganeſe and alumina §.

Variety 2. Compact red iron ore.

Found maſſive and ſtalactitic; ſometimes in cryſtals of various forms, but they ſeem to be only ſecondary; ſometimes in columns like baſalt.

Colour between brown red and ſteel grey. Stains the fingers. Luſtre 1 to 0; often ſemimetallic. Texture compact. Hardneſs 7 to 9. Brittle. Sp. gr. 3.423 to 3.76†. Sometimes inveſted with a roſy red ochre.

Variety 3. Red ochre.

Found ſometimes in powder, ſometimes indurated. Colour blood red. Stains the fingers. Luſtre 0. Texture earthy. Hardneſs 3 to 5. Brittle.

Variety 4. Red ſcaly iron ore.

This variety is generally found incumbent upon other iron ores. Colour between cherry red and ſteel grey. Stains the fingers. Luſtre ſilky, inclining to metallic. Texture foliated. Feels unctuous. Hardneſs 3 to 4. Brittle. Heavy.

225 Argillaceous iron ore.

SPECIES 6. Argillaceous iron ore †.

Oxyd of iron combined or mixed with clay.

This ore is exceedingly common; and though it contains leſs iron than the ſpecies already deſcribed, it is, in this country at leaſt, preferred to them, becauſe the method of extracting pure iron from it is eaſier, or rather becauſe it is better underſtood.

Colour moſt commonly dark brown. Streak red or yellowiſh brown. Sp. gr. from 2.673 to 3.471 ‡. Before the blow-pipe blackens, and tinges borax olive green and blackiſh. It is compoſed of oxyd of iron, alumina, lime, ſilica in various proportions. It generally yields from 30 to 40 *per cent.* of iron.

Variety 1. Common argillaceous iron ore.

The minerals arranged under this variety differ conſiderably from each other in their external characters. They are found in maſſes of various ſhapes, and often form large ſtrata.

Colour various ſhades of grey, brown, yellow, and red. Streak reddiſh yellow or dark red. Luſtre 0. Hardneſs from 3 to 8. Smell earthy when breathed upon.

Variety 2. Columnar or ſcapiform iron ore.

This variety is found in columns, adhering to each other, but eaſily ſeparable: They are commonly incurvated, and their ſurface is rough. Colour browniſh red. Streak dark red. Slightly ſtains the fingers. Luſtre 0. Adheres ſtrongly to the tongue. Sound hollow. Feel dry. Texture earthy.

Variety 3. Acinoſe iron ore.

This variety is found in maſſes, and is commonly lenticular. Colour generally browniſh red. Luſtre metallic, nearly. Texture granular. Hardneſs 5 to 9. Brittle.

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† De Liſle, iii. 188.

‡ Hauy, Jour. de Min. N° xxxi. 33.

¶ Kirw. ii. 163.

† Gellert.

‡ Kirwan.

¶ Kirwan's Min. ii. 164.

† Briſſon.

‡ Kirwan.

† Kirw. ii. 168.

† Gellert.

‡ Kirwan.

§ Kirwan Min. ii. 169.

† Kirwan.

† Kirw. ii. 173.

‡ Kirwan.

Variety 4. Nodular, or kidney-form iron ore.
Ætites or *Eagleſtone*.

This variety, which was mentioned by the ancients, is generally found under the form of a rounded knob, more or leſs reſembling a kidney, though ſometimes it is quadrangular; and it contains within it a kernel, which is ſometimes looſe, and ſometimes adheres to the outſide rind. Colour of the ſtone yellowiſh brown; of the kernel ochre yellow. Surface generally fouled with earth. Luſtre of the rind metallic; of the kernel 0. Hardneſs from 4 to 7. Brittle.

Variety 5. Piſiform or granular iron ore.

This variety occurs in rounded maſſes, from the ſize of a pea to that of a nut. Surface rough. Colour commonly dark brown. Streak yellowiſh brown. Hardneſs 5 to 6. Brittle.

The oolitic ore found at Creuſot, near mount Cenis, belongs to this variety. It is compoſed of

50 lime,
30 iron,
20 alumina.

100

226
owland
on ore.
Kirw. ii. 79.

SPECIES 7. Lowland iron ore.*

This ſpecies of ore is ſuppoſed to conſiſt of oxyd of iron, mixed with clay and phoſphuret or phoſphat of iron. It is called lowland ore, becauſe it is found only in low grounds; whereas the laſt ſpecies is more commonly in high grounds; and is therefore called *highland ore*.

This ore occurs in amorphous maſſes, and alſo in grains or powder. Its colour is brown. Streak yellowiſh brown. Luſtre 0, or common. Texture earthy. Hardneſs 3 to 5.

Variety 1. Meadow lowland ore.

Colour blackiſh or yellowiſh brown: Both colours often meet in the ſame ſpecimen. Found in lumps of various ſizes, often perforated. Fracture compact. Moderately heavy.

Frequently yields from 32 to 38 *per cent*. of iron.

Variety 2. Swampy iron ore.

This variety is generally found under water. It is in lumps, which are commonly perforated or corroded, and mixed with ſand. Colour dark yellowiſh brown, or dark nut brown. Hardneſs 3 to 4. Brittle. Sp. gr. 2.944. It often contains .36 of iron.

Variety 3. Moraſſy iron ore.

This variety is found either in a looſe form or in perforated lumps. Colour light yellowiſh brown. Stains the fingers. Hardneſs 3. Friable.

227
G. VI.
Salts.
parry iron
re.

GENUS VI. SALTS OF IRON.

SPECIES 1. Sparry iron ore (G).

This ore is common in Germany, France, and Spain. It is found ſometimes in amorphous maſſes, and ſometimes cryſtallized.

Its colour is white; but it becomes tarniſhed by expoſure to the air, and then aſſumes various colours. Streak grey or white. External luſtre often metallic; internal common or glaſſy. Tranſparency 1 or 2; ſometimes 0. Texture foliated. Fragments rhomboidal. Hardneſs 5 to 7. Brittle. Sp. gr. 3.6 to 3.810. Not magnetic. Soluble in acids with very little effervefcence. Before the blow-pipe decrepitates, becomes browniſh black, and magnetic; but is ſcarcely fuſible. Tinges borax ſmutty yellow, with ſome efferveſcence.

This ore, as Bergman aſcertained, conſiſts of iron, mangeneſe, lime, and carbonic acid.

One ſpecimen, according to his analyſis, contained

38 iron,
24 manganeſe,
38 carbonat of lime.

100

Another contained 22 iron,
28 manganeſe,
50 carbonat of lime.

100

Whether the iron be combined with the carbonic acid is ſtill a diſputed point. The cryſtals of this ore are rhomboidal parallelopipeds; which is preciſely the form of carbonat of lime. This amounts nearly to a demonſtration, that the carbonic acid is combined with the lime; and that, as Cronſtedt and Hauy have ſuppoſed, this ore is merely carbonat of lime, contaminated with a quantity of the oxyds of iron and manganeſe.

228
Arſeniat of iron.

SPECIES 2. Arſeniat of iron.

Mr Prouſt has diſcovered this ore in Spain. Its colour is greeniſh white. Its texture granular. Inſoluble in water and nitric acid. When melted on charcoal, the arſenical acid eſcapes with efferveſcence ‡.

‡ *Ann. de Chim.* i. 195.

229
Sulphat of iron.

SPECIES 3. Sulphat of iron.

For a deſcription of this ſalt, ſee CHEMISTRY, n° 631. in this *Suppl.*

ORDER VII. TIN ORES (H).

TIN is employed to cover plates of iron and copper, and to ſilver the backs of looking glaſſes: It enters into the compoſition of pewter; and forms a very important article in dyeing.

230
Mines.

Tin ores are by no means ſo common as the ores of the metals which we have already deſcribed. They are found only in the *primitive mountains* (I). Hence Werner ſuppoſes them to be the moſt ancient of all metallic ores. They occur moſt frequently in granite, ſometimes in porphyry, but never in limeſtone.

(G) *Kirw.* II. 190.—*Bergman*, II. 184.—*Bayen. Jour. de Phyſ.* VII. 213.—*Razowmowſki, Mem. Lauſanne*, 1785, p. 149.

(H) *Geoffroy, Mem. Par.* 1738, p. 103.—*Morveau, Ann. de Chim.* XXIV. 127.

(I) Geologiſts have divided mountains into three claſſes; *primitive, ſecondary*, and *tertiary*. The *primitive* occupy the centre of all extenſive chains; they are the higheſt, the moſt rugged, and exhibit the moſt pointed tops. They are conſidered as the moſt ancient mountains of the globe.

The *ſecondary* mountains occupy the outſide of extenſive ranges. They are uſually compoſed of ſtrata, more or leſs inclined, and commonly reſt againſt the ſides of the primitive mountains.—The *tertiary* mountains are much ſmaller than the others, and are often ſolitary. We uſe the terms *primitive, ſecondary*, &c. merely as

proper

Almoſt the only tin mines known to Europeans are thoſe of Cornwal, Devonſhire, Saxony, Bohemia, Sileſia, Hungary, Gallicia; thoſe of the iſland of Banca and the peninſula of Malacca in India; and thoſe of Chili and Mexico in America.

231
G. I. Sulphurets. Sulphuret of tin and copper.

Genus I. sulphurets of tin.

species i. Sulphuret of tin and copper.*

Tin pyrites.

Hitherto this ore has only been found in Cornwal. There is a vein of it in that county, in the pariſh of St Agnes, nine feet wide, and twenty yards beneath the ſurface †.

Its colour is yellowiſh grey, paſſing into the ſteel grey. Not unlike grey copper ore. Luſtre metallic. Hardneſs 5 to 6. Very brittle. Sp. gr. 4.35 ‡. Before the blow-pipe it melts eaſily, with a ſulphureous ſmell, into a black bead, and depoſits a bluiſh oxyd on the charcoal.

The compoſition of this ore, as Klaproth informs us, was firſt diſcovered by Mr Raſpe. According to Klaproth's analyſis, it is compoſed of

34	tin,
36	copper,
25	Sulphur,
3	iron,
2	earth.
100 §	

* *Kirw.* ii. 200.

† *Klaproth's Cornwall*, p. 21.

‡ *Klaproth.*

§ *Id.* 58.

232
G. II. Oxyds. Brown oxyd of tin.

Genus II. oxyds of tin.

species i. Brown oxyd of tin.*

Tinſtone—Woodtin.

This ore, which may be conſidered as almoſt the only ore of tin, occurs in maſſes, in rounded pieces, and cryſtallized. Theſe cryſtals are very irregular. Hauy ſuppoſes, that their primitive form is a cube †; but Romé de Liſle, with more probability, makes it an octohedron; ‡ and in this opinion Mr Day agrees with him ||. The octohedron is compoſed of two four-ſided pyramids, applied baſe to baſe. The ſides of the pyramids are iſoſceles triangles, the angle at the vertex of which is 70°, and each of the other angles 55°. The ſides of the two pyramids are inclined to each other at an angle of 90° §. This primitive form, however, never occurs, but cryſtals of tinſtone are ſometimes found, in which the two pyramids are ſeparated by a priſm. For a complete deſcription of the varieties of the cryſtals of tinſtone, we refer the reader to *Romé de Liſle* and *Mr Day*.*

* *Kiru.* ii. 197.

† *Jour. de Min.* N° xxxii. 576.

‡ *Cryſtallog.* iii. 413.

|| *Philoſ. Mag.* iv. 152.

§ *Romé de Liſle, ibid.*

* *Philoſ. Mag. ibid.*

Its colour is commonly brown. Streak grey. Hardneſs 9 to 10. Sp. gr. 6.9 to 7.0. Brittle.

Variety 1. Common tinſtone.

Colour dark brown; ſometimes yellowiſh grey, and ſometimes nearly white. Streak light grey. Somewhat tranſparent when cryſtallized. Hardneſs 10. Sp. gr. 6.9 to 6.97. Before the blow-pipe it decrepitates, and on charcoal is partly reduced. Tinges borax white.

According to Klaproth, it is compoſed of

77.50	tin,
21.50	oxygen,
.25	iron,
.75	ſilica,
100.00 †	

† *Beiträge*, ii. 256.

Variety 2. Woodtin.

This variety has hitherto been found only in Cornwal. It occurs always in fragments, which are generally rounded. Colour brown; ſometimes inclining to yellow. Streak yellowiſh grey. Opaque. Texture fibrous. Hardneſs 9. Sp. gr. 7.0. Before the blow-pipe becomes browniſh red; decrepitates when red hot, but is not reduced.

Klaproth obtained from it .63 of tin; and, in all probability, it is an oxyd of tin nearly pure.

Order VIII. ORES OF LEAD.

The uſeful purpoſes to which lead in its metallic ſtate is applied, are too well known to require deſcription. Its oxyds are employed in painting, in dyeing, and ſometimes alſo in medicine.

Ores of lead occur in great abundance in almoſt every part of the world. They are generally in veins; ſometimes in ſiliceous rocks, ſometimes in calcareous rocks.

233
G. I. Sulphurets. Galena, or pure ſulphuret of lead.

Genus I. sulphurets of lead.

species i. Galena, or pure ſulphuret of lead ‡.

This ore, which is very common, is found both in maſſes and cryſtallized. The primitive form of its cryſtals is a cube. The moſt common varieties are the cube, ſometimes with its angles wanting, and the octohedron, compoſed of two four-ſided pyramids applied baſe to baſe: The ſummits of theſe pyramids are ſometimes cuneiform, and ſometimes their ſolid angles are wanting ||.

Its colour is commonly bluiſh grey, like lead. Streak bluiſh grey and metallic. Luſtre metallic. Sometimes ſtains

‡ *Kirw.* ii. 216.

|| *Romé de Liſle*, iii. 364.

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proper names, without affirming or denying the truth or falſehood of the theory on which theſe names are founded. That the reader may have a more accurate idea of the compoſition of theſe different claſſes of mountains, we have ſubjoined a liſt of the ſubſtances which, according to Werner, enter into the compoſition of each.

I. Primary Mountains.

1. Granite,
2. Gneiſs,
3. Micaceous ſhiſtus
4. Argillaceous ſhiſtus,
5. Syenite,
6. Porphyry,
7. Shiſtoſe porphyry,
8. Quartz,
9. Primitive limeſtone,
10. Serpentine,
11. Topaz rock.

II. Secondary Mountains.

1. Argillaceous ſhiſtus,
2. Rubble ſtone,
3. Secondary limeſtone,
4. Shiſtoſe hornblende,
5. Grunſtein,
6. Amygdaloid.

III. Tertiary Mountains.

1. Trap,
2. Argillaceous ſhiſtus,
3. Stratified limeſtone,
4. Sandſtone,
5. Breccia,
6. Coal,
7. Chalk,
8. Sulphat of lime,
9. Rock ſalt,
10. Ferruginous clay,
11. Potters earth.

ſtains the fingers. Texture foliated. Fragments cubical. Hardneſs 5 to 7; ſometimes even 9. Brittle. Sp. gr. 6.884 to 7.786 §. Efferveſces with nitric and muriatic acids. Before the blow-pipe decrepitates, and melts with a ſulphureous ſmell; part ſinks into the charcoal.

§ *Watſon.*

It is compoſed of from .45 to .83 lead, and from .086 to .16 of ſulphur. It generally contains ſome ſilver, and ſometimes alſo antimony and zinc.

Variety 1. Common galena.

This variety correſponds nearly with the above deſcription. Sp. gr. 7.051 to 7.786. Sometimes ſtains the fingers.

Compact galena.

Found only in amorphous maſſes. Texture compact, inclining to foliated. Hardneſs 6 to 8. Sp. gr. 6.886 to 7.444. Luſtre common. Streak lead grey, brighter and metallic. Often feels greaſy, and ſtains the fingers.

234 Sulphuret of lead, with ſilver and antimony.

SPECIES 2. Sulphuret of lead, with ſilver and antimony.*

* *Kirw.* ii. 119.

Plumbiferous antimoniated ſilver ore.

Found in amorphous maſſes. Colour grey. Hardneſs 5 to 6. Brittle. Sp. gr. from 5.2 to 8.

Variety 1. Light grey ſilver ore.

Colour light bluiſh grey. Streak light bluiſh grey, and brighter. Luſtre metallic. Texture compact. Before the blow pipe partly evaporates, and leaves a ſilver bead on the charcoal, ſurrounded by yellow duſt.

According to Klaproth, it contains

48.06 lead,
20.40 ſilver,
7.88 antimony,
12.35 ſulphur,
2.25 iron,
7.00 alumina,
.25 ſilica.

98.09 †

† *Beiträge*, ii. 172.

Variety 2. Dark grey ſilver ore.

Colour iron grey, verging on black. Powder black, and ſtains the fingers. Luſtre 0. Texture earthy.

According to Klaproth, it contains

41.00 lead,
21.50 antimony,
29.25 ſilver,
22.00 ſulphur,
1.75 iron,
1.00 alumina,
.75 ſilica.

97.25 ‡

‡ *Ibid.* 175.

235 Blue lead ore.

SPECIES 3. Blue lead ore.*

* *Kirw.* ii. 220.

This ore, which is found in Siberia, Germany, and Hungary, and is very rare, occurs ſometimes in maſſes, and ſometimes cryſtallized in ſix-ſided priſms.

Colour between indigo blue and lead grey; ſometimes inclining to black. Internal luſtre metallic. Streak brighter. Texture compact. Hardneſs 6. Sp. gr. 5.461. †. Before the blow-pipe melts with a low blue flame and a ſulphureous ſmell, and is eaſily reduced.

† *Gellert.*

236 Black lead ore.

SPECIES 4. Black lead ore ‡.

‡ *Kirw.* ii. 221.

This ore, which is found in Germany and Brittany, and which is ſuppoſed to be common galena decayed, is ſometimes in ſtalactites of various forms, and ſometimes cryſtallized in ſix-ſided priſms, which are generally truncated and confuſed.

Colour black, often with ſome ſtreaks of red. Streak light bluiſh grey. Internal luſtre metallic. Hardneſs 5 to 6. Brittle. Sp. gr. from 5.744. ‖ to 5.77.* Before the blow-pipe decrepitates, melts eaſily, and is reduced.

‖ *Briſſon.*
* *Gellert.*

According to the experiments of Laumont, this ore is a ſulphuret of lead (or rather ſulphuret of oxyd of lead), mixed with ſome phoſphat of lead.

237 Sulphuret of lead, biſmuth, and ſilver.

SPECIES 5. Sulphuret of lead, biſmuth, and ſilver.

This ore, which occurs in the valley of Schapbach in Saxony, was firſt taken notice of by Selb, and afterwards deſcribed by Weidenmann and Emerling.

Its colour is light bluiſh grey. Its luſtre metallic. Its fracture uneven. Hardneſs 5. Melts eaſily before the blow-pipe, emitting ſome ſmoke, and leaves a ſilver bead.

A ſpecimen, analyſed by Mr Klaproth, contained

33.0 lead,
27.0 biſmuth,
15.0 ſilver,
16.3 ſulphur,
4.3 iron,
0.9 copper.

96.5 †

† *Beiträge*, ii. 297.

GENUS II. OXYDS OF LEAD.

238 G. II. Oxyds. Lead ochre.

SPECIES 1. Lead ochre ‡.

‡ *Kirw.* ii. 205.

This ore, which is a mixture of the oxyd of lead with various earths, is found maſſive, and of various degrees of hardneſs.

Its colour is either yellow, grey or red. Luſtre 0. Tranſparency 0 to 1. Hardneſs 6 to 8; ſometimes in powder. Sp. gr. from 4.165 to 5.545 §. Texture compact. Efferveſces with nitric and muriatic acids. Eaſily reduced by the blow-pipe, leaving a black ſlag, unleſs the lead be mixed with too great a proportion of earth.

§ *Kirwan.*

GENUS III. SALTS OF LEAD.

239 G. III. Salts. Carbonat of lead.

SPECIES 1. Carbonat of lead ‡.

‡ *Kirw.* ii. 203.

White lead ſpar.

This ore of lead, which is very common, is ſometimes in maſſes, and ſometimes cryſtallized. But the cryſtallization is in general ſo confuſed, that the primitive form of the cryſtals has not yet been aſcertained (K).

Its colour is white. External luſtre, waxy or ſilky, from 3 to 1; internal 1 to 2. Generally ſomewhat tranſparent. Hardneſs 5 to 6. Brittle. Sp. gr. from 5.349 ‖ to 6.92 §. Efferveſces with nitric and muriatic acids when they are heated. Soluble in fat oils. Blackened by ſulphuret of ammonia.* Decrepitates when heated. Before the blow-pipe, in a ſilver ſpoon, it becomes red by the yellow cone of the flame, while the blue cone renders it yellow †. On charcoal it is immediately reduced.

‖ *Kirwan.*
§ *Gellert.*
* *Pelletier, Ann. de Chim.* ix. 56.
† *Ribbentropp, Ann. de Chim.* xxv. 189.

It contains from .60 to .85 of lead, and from .18 to .24 of carbonic acid. It is generally contaminated with carbonat of lime and oxyd of iron.

SPECIES

(K) See *Hauy, Jour. de Min.* N° XXXI. 502. and *Romé de Liſle*, III. 380.

Ores of Lead.

240 Phoſphat of lead.

SPECIES 2. Phoſphat of lead †.

† Kirw. ii. 207.

This ore, which is found in Siberia, Scotland, England, Germany, Carinthia, Brittany, &c. is ſometimes amorphous, and ſometimes cryſtallized. The primitive form of its cryſtals according to Romé de Liſle, is a dodecahedron, conſiſting of a ſix-ſided rectangular priſm, terminated by ſix-ſided pyramids, the ſides of which are iſoſceles triangles (L). Sometimes the pyramids are truncated and even altogether wanting. The cryſtals of this ore are often acicular.

Its colour is commonly green; ſometimes yellowiſh or browniſh, or greyiſh white. Streak commonly greeniſh white. Powder yellowiſh. External luſtre, waxy, 2 to 3. Somewhat tranſparent, except when its colour is greyiſh white. Hardneſs 5 to 6. Brittle. Sp. gr. from 5.86.* to 6.27 †. Inſoluble in water and ſulphuric acid, and nearly inſoluble in nitric acid; ſoluble in hot muriatic acid, with a ſlight efferveſcence ‡. Before the blow-pipe it eaſily melts on charcoal, and cryſtallizes on cooling: with ſoda the lead is in ſome meaſure reduced.

* Briſſon.
† Klaproth.
‡ Fourcroy, Ann. de Chim. ii. 207.

The compoſition of this ore was firſt diſcovered by Gahn.

According to Fourcroy's analyſis, a ſpecimen from Erlenbach in Alſace, conſiſts of

96 phoſphat of lead,
2 phoſphat of iron.
2 water.

100

Or it contains
79 oxyd of lead,
1 oxyd of iron,
18 phoſphoric acid,
2 water.

100 ¶

¶ Ibid.

241 Arſeniat of lead.

SPECIES 3. Arſeniat of lead §.

§ Kirw. ii. 209.

This ore, which has hitherto been found only in Andaluſia in Spain, and always in quartz or feldſpar, is in ſmall maſſes. Colour meadow green, often paſſing into wax yellow. Luſtre waxy, 2. Tranſparency 2. Before the blow-pipe it melts, and retains its colour, and does not cryſtallize on cooling. When heated to whiteneſs, the arſenic acid eſcapes, and the lead is reduced.*

* Prouſt, Jour. de Phyſ. xxx. 394.

242 Phoſphat and arſeniat of lead.

SPECIES 4. Phoſphat and arſeniat of lead.

Arſenio phoſphat of lead. †

† Kirw. ii. 210.

This ore, which has been found in Auvergne in France, is either in maſſes, or cryſtallized in ſmall ſix-ſided priſms, with curvilineal faces.

Colour yellowiſh green, or ſhews alternate layers of pale and light green. Powder yellowiſh. The cryſtals are ſomewhat tranſparent; but when maſſive, this ore is opaque. Hardneſs 5 to 7. Brittle. Sp. gr. 6.8465 ‡. Soluble in hot muriatic acid, but not in nitric. When heated it decrepitates. Before the blow-pipe melts eaſily, efferveſces, emits a white ſmoke, with an arſenical ſmell. Some particles of lead are reduced, a brown fluid remains, which cryſtallizes on cooling like phoſphat of lead.

‡ Briſſon.

Metallic Ores.

According to Fourcroy, from whom the whole of this deſcription has been taken, it is compoſed of

65 arſeniat of lead,
27 phoſphat of lead,
5 phoſphat of iron,
3 water.

100 *

* Ann. de Chim. ii. 23.

243 Molybdat of lead.

SPECIES 5. Molybdat of lead (M).

This ore, which is found in Carinthia and at Leadhills in Scotland, was firſt mentioned in 1781 by Mr Jacquin (N). It occurs either in maſſes, or cryſtallized in cubic, or rhomboidal, or octohedral plates.

Its colour is yellow. Streak white. Luſtre waxy. Generally ſomewhat tranſparent. Texture foliated. Fracture conchoidal. Hardneſs 5 to 6. Sp. gr. 5.486 †; when purified from its gangue by nitric acid, 5.706 ‡.

† Macquart.
‡ Hatchett.

Soluble in fixed alkalies and in nitric acid. Communicates a blue colour to hot ſulphuric acid. Soluble in muriatic acid, and decompoſed by it. Before the blow-pipe decrepitates, melts into a yellowiſh grey maſs, and globules of lead are reduced ‖.

‖ Macquart.

Klaproth firſt proved that this ore was molybdat of lead.

A very pure ſpecimen, analyſed by him, contained

64.42 oxyd of lead,
34.25 molybdic acid.

98.67 ¶

¶ Beiträge, ii. 275.

According to the analyſis of Mr Hatchett, it is compoſed of

58.40 oxyd of lead,
38.00 molybdic acid,
2.10 oxyd of iron,
.28 ſilica.

98.78 *

* Phil. Tranſ. lxxxvi. 323.

Macquart found a ſpecimen to contain

58.74 lead,
4.76 oxygen,
28.00 molybdic acid,
4.50 carbonat of lime,
4.00 ſilica.

100.00 †

† Jour. de Min. N° xvii. 32.

Its gangue is carbonat of lime.

244 Sulphat of lead.

SPECIES 6. Sulphat of lead ‡.

‡ Kirw. Min. ii. 211.

This ore, which is found in Angleſey and in Andaluſia, is generally cryſtallized. The cryſtals are regular octohedrons §, and very minute.

§ Hauy, Jour. de Min. N° xxxi. 508.

Colour white. Luſtre 4. Tranſparency 4. Before the blow-pipe it is immediately reduced.

The compoſition of this ore was firſt aſcertained by Dr Withering.

ORDER IX. ORES OF ZINC.

HITHERTO zinc has not been applied to a great variety of uſes. It enters into the compoſition of braſs; it is uſed in medicine; and Morveau has ſhewn that its oxyd

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(L) *Cryſtal.* III. 391. See alſo *Hauy's* remarks on the ſame ſubject in the *Jour. de Min.* N° XXXI, 506.

(M) *Kirw.* II. 212.—*Klaproth, Ann. de Chim.* VIII. 103.—*Hatchett, Phil. Tranſ.* 1796, p. 285.

(N) In his *Miſcellanea Auſtriaca*, Vol. II. p. 139.

Ores of Zinc.

oxyd might be employed with advantage as a white paint.

Ores of zinc are very abundant; they generally accompany lead ores, particularly galena. Calamine, or oxyd of zinc, has never been diſcovered in the primitive mountains.

245
G. I. Sulphurets. Common ſulphuret of zinc.

Genus I. sulphurets of zinc.

species i. Common ſulphuret of zinc.*

Blende.

This ore very commonly accompanies ſulphuret of lead. It occurs both in amorphous maſſes and cryſtallized. The primitive form of its cryſtals is a rhomboidal dodecahedron, conſiſting of a ſix-ſided priſm, terminated by three-ſided pyramids. All the faces of the cryſtals are equal rhombs. This dodecahedron may be mechanically divided into four equal rhomboidal parallelopipeds, and each of theſe into ſix tetrahedrons, whoſe faces are equal iſoſceles triangles. The figure of its integrant particles is the tetrahedron, ſimilar to theſe.*

The principal varieties of its cryſtals are the tetrahedron; the octohedron: the octohedron with its edges wanting;* a 24-ſided cryſtal, 12 of whoſe faces are trapezoids, and 12 elongated triangles;† and, laſtly a 28-ſided figure, which is the laſt variety, augmented by four equilateral triangles †.

Colour yellow, brown, or black. Streak reddiſh, browniſh, or grey. Luſtre commonly metallic. Generally ſomewhat tranſparent. Texture foliated. Hardneſs 6 to 8. Sp. gr. 3.93 ‡ to 4.1665 ¶. Before the blow-pipe decrepitates, and gives out white flowers of zinc, but does not melt. Borax does not affect it. When breathed upon, loſes its luſtre, and recovers it very ſlowly ‖.

Variety 1. Yellow blende.

Colour commonly ſulphur yellow, often paſſing into olive green or browniſh red. Powder pale yellow. Streak yellowiſh or reddiſh grey, not metallic. Luſtre metallic. Tranſparency 2 to 4. Often phoſphoreſces when ſcraped or rubbed.*

According to Bergman, it is compoſed of

64 zinc,
20 ſulphur,
5 iron,
4 fluor acid,
1 ſilica,
6 water.

100†

Variety 2. Brown blende.

Colour different ſhades of Brown. Surface often tarniſhed. Powder browniſh grey. Streak reddiſh or yellowiſh grey, not metallic. Luſtre commonly metallic. Tranſparency 0 to 2.

A ſpecimen of this variety, analyſed by Bergman, contained

44 zinc,
17 ſulphur,
24 ſilica,
5 iron,
5 alumina,
5 water.

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100 ‡

Variety 3. Black blende.

Colour black, or browniſh black; ſurface often tarniſhed blue; tips of the cryſtals often [illegible] red. Powder browniſh black. Streak reddiſh, browniſh, or grey. Luſtre common or metallic. Tranſparency 0 to 1; the red parts 2. Hardneſs 8.

Metallic Ores.

A ſpecimen of this variety, analyſed by Bergman, contained

52 zinc,
26 ſulphur,
4 copper,
8 iron,
6 ſilica,
4 water.

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100 ‡

246
G. II. Oxyds. White oxyd of zinc.

Genus II. oxyds of zinc.

species i. White oxyd of zinc †.

Calamine.

This ore is either found looſe, or in maſſes, or cryſtallized. The primitive form of its cryſtals appears, from the mechanical diviſion of one of them by Mr Hauy, to be an octohedron compoſed of two four-ſided pyramids, whoſe ſides are equilateral triangles †. But the cryſtals are minute, and their figure not very diſtinct. They are either four or ſix-ſided tables with bevelled edges, ſix-ſided priſms, or three-ſided pyramids.

Colour commonly white, grey, or yellow. Luſtre often 0, ſometimes 2 or 1. Opaque. The cryſtals are ſomewhat tranſparent. Hardneſs from 4 to 9, ſometimes in powder. Sp. gr. from 2.585 to 3.674 ‡. When heated, becomes electric, without friction, like the tourmaline †. Not blackened by ſulphuret of ammonia. Soluble in ſulphuric acid. Before the blow-pipe decrepitates, and does not melt.

This ore conſiſts of oxyd of zinc more or leſs contaminated with iron, ſilica, lime, and other foreign ingredients. In one ſpecimen Bergman found the following ingredients:

84 oxyd of zinc,
3 oxyd of iron,
12 ſilica,
1 alumina.

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100 ¶

In another ſpecimen, which gelatinized with acids, like zeolite, Klaproth found

66 oxyd of zinc,
33 ſilica.

99

In another ſpecimen, analyſed by Pelletier, the contents were

52 ſilica,
36 oxyd of zinc,
12 water.

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100 *

Mr Kirwan has divided this ſpecies into three varieties.

Variety 1. Friable calamine.

In maſſes which eaſily crumble between the fingers. Luſtre 0. Opaque. Texture earthy. When its colour is white, it is pure oxyd of zinc; when yellow, it is mixed with oxyd of iron. The white often becomes yellow when placed in a red heat, but reſumes its colour on cooling. Common in China, where it is called *wohan* or *ore of Tutenago.*

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* *Kirw.* ii. 238.—*Berg.* ii. 329.

* *Hauy, Jour. de Min.* N° xxxiii. 669.

* Fig. 40.

† Fig. 41.

† See *Hauy, ibid* and *Romé de Liſle*, iii. 65.

‡ *Gellert.*

¶ *Briſſon.*

‖ *Hauy, Jour. de Min. ibid.*

* *Bergman*, ii. 345.

† *Ibid.* 347.

‡ *Ibid.* 333.

‡ *Bergman*, ii. 335.

† *Kirw.* ii. 233.—*Berg.* ii. 321.

† *Jour. de Min.* N° xxxii. 596.

‡ *Kirwan.*

† *Hauy, Jour. de Min. ibid.*

¶ *Bergman*, ii. 323.

* *Jour. de Phyſ.* xx. 428.

Variety 2. Compact calamine.

Colour different ſhades of grey; ſometimes yellow or browniſh red. Luſtre 0. Opaque. Texture compact.

Variety 3. Striated calamine.

This variety alone is found cryſtallized; but, like the others, it is alſo often amorphous. Colour white, and alſo various ſhades of grey, yellow, and red. Somewhat tranſparent. Texture ſtriated. Luſtre 2 to 1.

247
G. III. Salts.
Sulphat of zinc.

Genus III. SALTS OF ZINC.

SPECIES 1. Sulphat of zinc.

For a deſcription of this ſalt, we refer to Chemistry, n° 643. *Suppl.*

Order X. ORES OF ANTIMONY.

Antimony is much uſed to give hardneſs to thoſe metals which otherwiſe would be too ſoft for certain purpoſes: printers types, for inſtance, are compoſed of lead and antimony. It is uſed alſo in medicine.

Ores of antimony are found abundantly in Germany, Hungary, France, Spain, Britain, Sweden, Norway, &c. They often accompany galena and hæmatites. They are found both in the ſecondary and primitive ſtratified mountains. Their gangue (o) is often quartz and ſulphat of barytes.

248
G. I. Alloys
Native antimony.
* Kirw. ii. 245.

Genus I. ALLOYS OF ANTIMONY.

SPECIES 1. Native antimony*.

This mineral, which was firſt diſcovered by Dr Swab, has been found in Sweden and in France, both in maſſes and kidney-ſhaped lumps. Colour white, between that of tin and ſilver. Luſtre metallic. Texture foliated. Hardneſs 6. Sp. gr. above 6. Deflagrates with nitre. Before the blow-pipe melts and evaporates, depoſiting a white oxyd of antimony.

It conſiſts of antimony, alloyed with 3 or 4 *per cent.* of arſenic.

249
G. II. Sulphurets.
Grey ore of antimony.
* Kirw. ii. 247.
† *Romé de Liſle*, iii. 49.
‡ *Ibid.*—See alſo *Hauy*, *Jour. de Min.* N° xxxii. 606.
¶ *Briſſon.*

Genus II. SULPHURETS OF ANTIMONY.

SPECIES 1. Grey ore of antimony*.

This ore, which is the moſt common, and indeed almoſt the only ore of antimony, occurs both maſſive, diſſeminated, and cryſtallized. Its cryſtals are four-ſided priſms, ſomewhat flattened, whoſe ſides are nearly rectangles, terminated by ſhort four-ſided pyramids, whoſe ſides are trapeziums†. Sometimes two of the edges are wanting, which renders the priſm ſix-ſided‡.

Colour grey. Luſtre metallic. Streak grey, metallic, and brighter. Powder black or greyiſh black. Hardneſs 6 to 7. Sp. gr. from 4.1327 to 4.516¶. Often ſtains the fingers. Before the blow-pipe melts eaſily, burns with a blue flame, and depoſits a white oxyd on the charcoal. When placed in an open veſſel, over a ſlow fire, the ſulphur evaporates, and leaves a grey oxyd of antimony. This oxyd, if fuſed with tartar, is reduced.

This ore, when taken out of the mine, almoſt always contains a large proportion of quartz or other ſtony matter. When pure, it is compoſed of about

74 antimony,
26 ſulphur.
———
100

Werner has divided this ſpecies into three varieties.

Variety 1. Compact ſulphuret.

Colour bluiſh grey, ſurface often tarniſhed, and then it is blue or purpliſh. Luſtre 1 to 2. Texture compact. Fracture fine grained, uneven. Powder black, dull, and earthy. Slightly ſtains the fingers.

Variety 2. Foliated ſulphuret.

Colour light ſteel grey. Luſtre 3 to 4. Texture foliated. Powder as that of the laſt variety.

Variety 3. Striated ſulphuret.

Colour dark ſteel grey, and light bluiſh grey; ſurface often tarniſhed, and then it is dark blue or purpliſh. Luſtre 3 to 2. Texture ſtriated. Powder greyiſh black. This variety alone has been hitherto found cryſtallized.

250
Plumoſe antimonial ore.
† *Kirw.* ii. 250.

SPECIES 2. Plumoſe antimonial ore†.

Sulphurets of antimony and arſenic.

This ſpecies, which is ſometimes found mixed with the cryſtals of ſulphurated antimony, is in the form of brittle, capillary, or lanuginous cryſtals, often ſo ſmall that they cannot be diſtinctly ſeen without a microſcope.

Colour ſteel or bluiſh grey, often tarniſhed, and then brown or greyiſh black. Luſtre 1, ſemimetallic. Before the blow-pipe emits a ſmoke, which depoſits a whitiſh and yellowiſh powder on the charcoal: it then melts into a black ſlag.

It is ſuppoſed to conſiſt of ſulphur, antimony, arſenic, and ſome ſilver.

251
Red antimonial ore.
† *Kirw.* ii. 250.
* *Ann. de Chim.* xxv. 259.

SPECIES 3. Red antimonial ore†.

Hydroſulphuret of antimony.

This ſpecies is generally found in cavities of ſulphurated antimonial ore. It is cryſtallized in delicate needles, often diverging from a common centre.

Colour red. Luſtre 2, ſilky. Sp. gr. 4.7. Before the blow-pipe melts eaſily, and evaporates with a ſulphureous ſmell.

This ore has not been analyſed. Mineralogiſts have ſuppoſed it to be a natural kermes. If ſo, we may conclude, from the experiments of Berthollet*, that it is a hydroſulphuret of antimony, and conſequently compoſed of oxyd of antimony, ſulphur, and ſulphurated hydrogen gas.

252
G. III.
Oxyds of antimony.

Genus III. OXYDS OF ANTIMONY.

There is a ſubſtance found incumbent on ſulphuret of antimony, of a yellow colour, and an earthy appearance, which has been ſuppoſed an oxyd of antimony, and denominated antimonial ochre. But hitherto it has not been analyſed.

Genus

(o) The word *gang* is uſed by German mineralogiſts to denote a metallic vein. Now, it is not often that theſe veins conſiſt entirely of *ore;* in general, they contain ſtony matter beſides. For inſtance, in the copper mine at Airthry, near Stirling, the copper ore is merely a narrow ſtripe in the middle of the vein, and the reſt of it is filled up with ſulphat of barytes. We uſe the word *gangue* (as the French do), to denote, not the *metallic* vein, but the *ſtony* matter which accompanies the ore in the vien. The gangue of the copper ore at Airthry is ſulphat of barytes.

Ores of Biſmuth.

253 G. IV. Salts. Muriat of antimony.

Genus IV. salts of antimony.

species 1. Muriat of antimony*.

This ore, which has been found in Bohemia, is ſometimes in quadrangular tables; ſometimes in acicular cryſtals grouped like zeolites; and ſometimes in priſms.

* Kirw. ii. 251.

† Hauy, Jour. de Min. N° xxxii. 609.

Colour pale yellowiſh or greyiſh white. Luſtre 3 to 1, nearly metallic. Tranſparency 2. Texture foliated. Melts eaſily by the flame of a candle, and emits a white vapour†. Before the blow-pipe decrepitates; when powdered, and juſt ready to melt, it evaporates, and leaves a white powder around. Between two pieces of coal it is reducible to a metallic ſtate.

Order XI. ORES OF BISMUTH*.

* Pott, Obſerv. Chym. 134—Geoffroy, Mem. Par. 1753, p. 296.

Bismuth is employed in the manufacture of pewter, of printers types, in ſoldering; and perhaps alſo its property of rendering other metals more fuſible, might make it uſeful in anatomical injections. The quantity conſumed in commerce is not great.

It has been found only in the primitive mountains, and is by no means common. When unaccompanied by any other metal, it does not form veins, but kidney-form maſſes. It often accompanies cobalt. Its gangue is commonly quartz. Its ores are not very abundant. They have been found chiefly in Sweden, Norway, Tranſylvania, Germany, France, and England.

254 G. I. Alloys. Native biſmuth.

Genus I. alloys of bismuth.

species 1. Native biſmuth*.

* Kirw. ii. 264.

This mineral, which is found at Schneeberg, Johanngeorgenſtadt, &c. in Germany, has commonly the form of ſmall plates lying above one another. Sometimes it is cryſtallized in four-ſided tables, or indiſtinct cubes.

† Briſſon.

‡ Kirwan.

Colour white with a ſhade of red; ſurface often tarniſhed red, yellow, or purple. Luſtre metallic, 3 to 2. Opaque. Texture foliated or ſtriated. Hardneſs 6. Sp. gr. 9.022† to 9.57‡. Exceedingly fuſible. Before the blow-pipe gives a ſilvery white bead, and at laſt evaporates in a yellowiſh white ſmoke, which is depoſited on the charcoal.

It is generally accompanied by cobalt, and ſometimes contains arſenic.

255 G. II. Sulphurets. Common ſulphuret of biſmuth.

Genus II. sulphurets of bismuth.

species 1. Common ſulphuret of biſmuth*.

* Kirw. ii. 266—Sage, Mem. Par. 1782, 307.

This ore, which is found in Sweden, Saxony, and Bohemia, occurs ſometimes in amorphous maſſes, and ſometimes in needleform cryſtals.

† Kirwan.

‡ Briſſon.

Colour commonly bluiſh grey, ſometimes white; ſurface often tarniſhed yellow, red, and purple. Powder black and ſhining. Luſtre metallic, 2 to 3. Streak obſcurely metallic. Texture foliated. Hardneſs 5. Brittle. Sp. gr. 6.131† to 6.4672‡. When held to the flame of a candle, it melts with a blue flame and ſulphureous ſmell. Before the blow-pipe emits a reddiſh yellow ſmoke, which adheres to the charcoal. This powder becomes white when it cools, and reſumes its former colour when the flame is directed upon it*.

* Gillet, Jour. de Min. N° xxiii. 585.

This ore, according to Sage, contains 60 biſmuth,
And, according to La Perouſe, it holds 36 ſulphur.

99

A ſpecimen, analyſed by Klaproth, contained
95 biſmuth,
5 ſulphur.

100†

† Beiträge, i. 256.

It is commonly accompanied by quartz, aſbeſtos, or ſparry iron ore.

256. G. III. Oxyds. Yellow oxyd of biſmuth.

Genus III. oxyds of bismuth.

species 1. Yellow oxyd of biſmuth‡.

Biſmuth ochre.

‡ Kirw. ii. 265.

This ore generally accompanies the two ſpecies already deſcribed. It is found in two ſtates; either of an earthy conſiſtence, or cryſtallized in cubes or quadrangular plates.

Colour uſually greeniſh yellow, ſometimes grey. Soluble in nitrous acid without effervescence, and may in a great meaſure be precipitated by the effuſion of water.

Order XII. ORES OF ARSENIC.

Arsenic is uſed as an alloy for ſeveral other metals, eſpecially copper. It is ſometimes employed to facilitate the fuſion of glaſs, or to render it opaque, in order to form an enamel. Preparations of arſenic are employed as paints; and, like moſt other violent poiſons, it has been introduced into medicine.

This metal is ſcattered in great abundance over the mineral kingdom, accompanying almoſt every other metal, and forming alſo ſometimes peculiar veins of its own. Of courſe it occurs in almoſt every ſpecies of mountain, and is accompanied by a variety of gangues.

257 G. I. Alloys. Native arſenic.

Genus I. alloys of arsenic.

species 1. Native arſenic†.

† Kirw. ii. 255.

This mineral is found in different parts of Germany. It occurs generally in maſſes of various ſhapes, kidney-form, botryoidal, &c.

† Kirwan.

‡ Briſſon.

Colour that of ſteel. Its ſurface quickly becomes tarniſhed by expoſure to the air. Luſtre metallic (when freſh), 3 to 2. Streak bluiſh grey, metallic, and bright. Powder dull and black. Texture compact. Hardneſs 7 to 8. Brittle. Sp. gr. 5.67† to 5.7249‡. Gives an arſenical ſmell when ſtruck. Before the blow-pipe emits a white ſmoke, diffuſes a garlic ſmell, burns with a blue flame, gradually evaporates, depoſiting a white powder.

§ De Born. Catal. of M. Raab, ii. 194.

It is always alloyed with ſome iron§, and often contains ſilver, and ſometimes gold.

258 G. II. Sulphurets. Orpiment.

Genus II. sulphurets of arsenic.

species 1. Orpiment (p).

Auripigmentum.

This ore, which is found in Hungary, Wallachia, Georgia, and Turkey in Aſia, is either maſſive or cryſtallized. The cryſtals are confuſed, and their figure cannot be eaſily determined; ſome of them appear octohedrons, and others minute four-ſided priſms.

* Kirwan.

‡ Gellert.

Its colour is yellow. Streak orange yellow. Luſtre waxy, 2 to 3. Tranſparency from 0 to 2. Texture foliated. Hardneſs 4 to 8. Sp. gr. from 3.048* to 3.521‡. Effervesces with hot nitric acid. Burns with a

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(p) *Kirw.* II. 260.—*Alberti de Auripigmento.*—*Scopoli in Anno 5to Hiſt. Naturali*, p. 59,—*Berg.* II. 297.

Ores of Arſenic.

a bluiſh white flame. Before the blow-pipe melts, ſmokes, and evaporates, leaving only a little earth and ſome traces of iron.

Compoſed of 80 ſulphur,
20 arſenic.

100

259.
Realgar.

SPECIES 2. Realgar.*

This mineral is found in Sicily, about Mount Veſuvius, in Hungary, Tranſylvania, and various parts of Germany. It is either maſſive or cryſtallized. The primitive form of the cryſtals is, according to Romé de Liſle, a four-ſided rhomboidal priſm, terminated by four-ſided pyramids, the ſides of which are rhombs †. It commonly appears in 4, 6, 8, 10, or 12 ſided priſms, terminated by four-ſided ſummits ‡.

Colour red. Streak yellowiſh red. Powder ſcarlet. Luſtre 3 to 2. Tranſparency from 2 to 3; ſometimes 0. Hardneſs 5 to 6. Sp. gr. 3.3384 §. It is an electric *per ſe*, and becomes negatively electric by friction ‖. Nitric acid deprives it of its colour. Before the blow-pipe it melts eaſily, burns with a blue flame and garlic ſmell, and ſoon evaporates.

Compoſed of 20 ſulphur,
80 arſenic.

100

* *Kirw.* ii. 261—*Berg.* ii. 297.

† *Cryſtall.* iii. 34.

‡ *Ibid.*

§ *Briſſon.*

‖ *Hauy, Jour. de Min.* N° xxxii. 612.

260
G. III.
Oxyds.
White oxyd of arſenic.

GENUS III. OXYDS OF ARSENIC.

SPECIES 1. White oxyd of arſenic.*

Native calx of arſenic.

This ore is found in various parts of Germany, Hungary, &c. either in powder, or maſſive, or cryſtallized in priſmatic needles.

Colour white or grey, often with a tint of red, yellow, green, or black. Luſtre common, 1 to 2. Tranſparency 1 to 0; when cryſtallized, 2. Texture earthy. Hardneſs 6. Brittle. Sp. gr. 3.7 †. Soluble in hot diluted nitric acid without efferveſcence. Soluble at 60° Fahreneit in 80 times its weight of water. Before the blow-pipe ſublimes, but does not inflame. Tinges borax yellow.

* *Kirw.* ii. 258—*Berg.* ii. 285.

† *Kirwan.*

ORDER XIII. COBALT ORES.

COBALT is employed to tinge glaſs of a blue colour, and is uſeful in painting upon porcelain.

Cobalt ores are found almoſt excluſively in the ſtratified mountains, except one ſpecies, ſulphuret of cobalt, which affects the primitive mountains. They are not very abundant; and for that reaſon cobalt is more valuable than many of the other metals which have been already treated of. They are commonly accompanied by nickel, biſmuth, or iron. They are moſt abundant in Germany, Sweden, Norway, and Hungary; they have been found alſo in Britain and France, but not in any great quantity.

261
G. I. Alloys.
Cobalt alloyed with arſenic.

GENUS I. ALLOYS OF COBALT.

SPECIES 1. Cobalt alloyed with arſenic †.

Dull grey cobalt ore.

This ore, which occurs in different parts of Germany, is either amorphous or cryſtallized. The forms of its cryſtals are the cube; ſometimes the cube with its angles, or edges, or both wanting; and the octohedron ‡.

Metallic Ores.

Its colour, when freſh broken, is whitiſh or bluiſh grey, ſometimes with a ſhade of red; when expoſed to the air it ſoon becomes tarniſhed. Streak bluiſh grey and metallic. Luſtre ſcarcely metallic, 0 to 1. Texture compact. Hardneſs 10. Difficultly frangible. Sp. gr. when amorphous, 5.309 to 5.571 §; when cryſtallized 7.7207 †. When ſtruck it gives out an arſenical ſmell. Before the blow-pipe it gives out an arſenical vapour, becomes magnetic, and melts eaſily, unleſs it contains a great quantity of iron. Tinges borax dark blue, and a ſmall metallic bead is obtained.

† *Kirw.* ii. 270.

‡ *Romé de Liſle*, iii. 123.

§ *Kirw.* ii. 270.

† *Hauy, Jour. de Min.* N° xxxii. 588.

A ſpecimen of this ore from Cornwall, examined by Mr Klaproth, contained 20 cobalt,
24 iron,
33 arſenic,

77

with ſome biſmuth and ſtony matter.*

Another ſpecimen from Tunaberg, according to the analyſis of the ſame chemiſt, contained
55.5 arſenic,
44.0 cobalt,
.5 ſulphur.

100 †

* *Klaproth's Cornwall*, p. 61.

† *Beitröge* ii. 307.

262
G. II. Sulphurets.
White cobalt ore.

GENUS II. SULPHURETS OF COBALT.

SPECIES 1. White cobalt ore ‡.

Sulphuret of cobalt, arſenic, and iron.

The deſcriptions which different mineralogiſts have given of this ore are ſo various, that it is impoſſible not to ſuppoſe that diſtinct ſubſtances have been confounded together.

It occurs either in maſſes, or cryſtallized in cubes, dodecahedrons, octohedrons, and icoſahedrons.

Colour tin white, ſometimes tarniſhed reddiſh or yellowiſh. Powder ſteel grey. Luſtre partly metallic, and from 2 to 4; partly 0 or 1. Texture foliated. Hardneſs 8 to 9. Sp. gr. from 6.284 † to 6.4509 ‡. Before the blow-pipe generally gives out an arſenical vapour, and does not melt.

‡ *Kirw.* ii. 273.—*Sage Jour. de Phyſ.* xxxix. 53.

† *Kirwan.*

‡ *Hauy.*

The analyſes that have been given of this ore are very various. Sometimes it has been found to contain no arſenic nor iron, and ſometimes, to contain both. A ſpecimen from Tunaberg in Sweden, which ought to belong to this ſpecies, was analyſed by Taſſaert, and found to conſiſt of 49 arſenic,
36.6 cobalt,
5.6 iron,
6.5 ſulphur.

97.8 †

Klaproth found a ſpecimen of the ſame ore to contain
55.5 arſenic,
44.0 cobalt,
0.5 ſulphur.

100.0 ‡

† *Ann. de Chim.* xxviii. 100.

‡ *Beiträge*, ii. 307.

263
G. III.
Oxyds.
Black cobalt ore or ochre.

GENUS III. OXYDS OF COBALT.

SPECIES 1. Black cobalt ore or ochre §.

This ore, which occurs in different parts of Germany, is either in the form of a powder, or indurated.

Colour black, often with a ſhade of blue, grey, brown, or green. Luſtre 0 to 1. Streak brighter. Hardneſs (of the indurated) from 4 to 8. Sp. gr. 3 to 4. Soluble in muriatic acid. Tinges borax blue.

§ *Kirw.* ii. 275.

SPECIES

264 Brown cobalt ore. * Kirw. ii. 276.

SPECIES 2. Brown cobalt ore.*

Colour greyiſh or dark leather brown. Streak brighter, unctuous. Communicates a pale blue tinge in fuſion.

265 Yellow cobalt ore. † Ibid.

SPECIES 3. Yellow cobalt ore †.

Colour yellow. Dull and earthy. Hardneſs 4 to 5. Texture earthy. Streak brighter, unctuous. Gives a weak blue tinge.

266 G. IV. Salts. Arſeniat of cobalt. ‡ Ib. 278.

GENUS IV. SALTS OF COBALT.

SPECIES 1. Arſeniat of cobalt ‡.

Red cobalt ore.

This ſpecies, like moſt other ores of cobalt, has neither been accurately deſcribed nor analyſed.

It is found in maſſes of various ſhapes, and cryſtallized in quadrangular tables or acicular priſms.

Colour red. Luſtre from 2 to 3, ſometimes 0. Tranſparency 0 to 2. Hardneſs 5 to 7. Brittle. Before the blow-pipe becomes blackiſh grey. Diffuſes a weak arſenical ſmell. Tinges borax blue.

ORDER XIV. ORES OF NICKEL.

HITHERTO nickel has been found in too ſmall quantities to be applied to any uſe; of courſe there are, properly ſpeaking, no mines of nickel. It occurs only (as far as is yet known) in the ſecondary mountains, and it commonly accompanies cobalt. It has been found in different parts of Germany, in Sweden, Siberia, Spain, France, and Britain.

267 G. I. Sulphurets. Sulphuret of nickel with arſenic and iron. * Ibid. 286. ‡ Briſſon.

GENUS I. SULPHURETS OF NICKEL.

SPECIES 1. Sulphuret of nickel with arſenic and iron.

*Kupfer nickel.**

This, which is the moſt common ore of nickel, occurs either maſſive or diſſeminated, but never cryſtallized.

Colour often that of copper, ſometimes yellowiſh white or grey. Recent fracture often ſilver white. Luſtre metallic, 2 to 3. Texture compact. Hardneſs 8. Sp. gr. 6.6086 to 6.6481 ‡. Soluble in nitric and nitro-muriatic acids. Solution green. Before the blow-pipe exhales an arſenical ſmoke, and melts into a bead which darkens by expoſure to the air.

It is compoſed of various proportions of nickel, arſenic, iron, cobalt, ſulphur; often contains biſmuth, and ſometimes ſilver and copper.

268 G. II. Oxyds. Nickel ochre. * Kirw. ii. 284.

GENUS II. OXYDS OF NICKEL.

SPECIES 1. Nickel ochre.*

This mineral occurs either in the form of a powder, or indurated, and then is either amorphous, or cryſtallized in acicular form cryſtals. The powder is generally found on the ſurface of other nickel ores.

Colour different ſhades of green. Luſtre 1 to 0. Texture earthy. Sp. gr. conſiderable. Slowly diſſolves in acids: ſolution green. Before the blow-pipe does not melt; but gives a yellowiſh or reddiſh brown tinge to borax.

This ore often contains ſulphat of nickel, which is ſoluble in water. The ſolution, when evaporated, gives oblong rhomboidal cryſtals, from which alkalies precipitate a greyiſh green oxyd. This oxyd is ſoluble by acids and by ammonia. The acid ſolution is green; the alkaline blue.

269 G. III. Salts. Arſeniat of nickel. † Kirw. ii. 285.

GENUS III. SALTS OF NICKEL.

SPECIES 1. Arſeniat of nickel †.

This ore, which was lately diſcovered at Regendorff by Mr Gmelin, is found in ſhapeleſs maſſes, and is often mixed with plates of ſulphat of barytes.

Colour pale grey, here and there mixed with pale green. Streak white. Luſtre 0. Texture compact. Hardneſs 7. Difficultly frangible. Sp. gr. conſiderable. Adheres ſlightly to the tongue, and gives an earthy ſmell when breathed on. Soluble in hot nitric and muriatic acids: ſolution green.

Contains ſome cobalt and alumina.

ORDER XV. ORES OF MANGANESE (℮).

HITHERTO manganeſe, in its metallic ſtate, has ſcarcely been put to any uſe; but under the form of an oxyd it has become of great importance. The oxyd of manganeſe has the property of rendering colourleſs a variety of bodies which injure the tranſparency of glaſs; and it has been long uſed in glaſs manufactories for this purpoſe under the name of *glaſs ſoap*. By means of the ſame oxyd, oxy-muriatic acid is prepared, which has rendered manganeſe of great importance in bleaching. Not to mention the utility of manganeſe to the chemiſt, the property which it has of facilitating the oxydation of other metals, and of rendering iron more fuſible—will probably make it, in no very remote period, of very conſiderable importance in numerous manufactories.

Ores of manganeſe occur often in ſtrata, both in the primitive and ſecondary mountains; ſcarcely ever, however, we believe, in thoſe mountains which are conſidered as the moſt ancient of all. They are very common, having been found abundantly in Germany, France, Spain, Britain, Sweden, Norway, Siberia, and other countries.

270 G. I. Oxyds.

GENUS I. OXYDS OF MANGANESE.

Hitherto manganeſe has only been found in the ſtate of oxyd. La Perouſe, indeed, ſuſpected that he had found it in a metallic ſtate: but probably there was ſome miſtake or other in his obſervations.

271 Oxyd of manganeſe combined with barytes.

SPECIES 1. Oxyd of manganeſe combined with barytes.

This ſpecies, which exiſts in great abundance in Romaneche near the river Soane in France, is found maſſive, forming a ſtratum in ſome places more than 12 feet thick.

Colour greyiſh black or browniſh black, of great intenſity. Luſtre, external, 0; internal, metallic, 1. Soon tarniſhes by expoſure to the air, and then becomes intenſely black. Texture granular. Fracture uneven; ſometimes conchoidal. Often porous. Hardneſs 11. Difficultly frangible. Sp. gr. from 3.950 to 4.10. Abſorbs water. When taken out of water after a minute's immerſion, it has a ſtrong argillaceous ſmell. Conducts electricity nearly as well as if it were in a metallic ſtate ‡. Infuſible by the blow-pipe. Tinges ſoda red; the colour diſappears before the blue cone of flame, and is reproduced by the action of the yellow flame.

From

(℮) *Pott. Miſcellan. Berolin*, VI. 40—*Margraff, Mem. Berlin*, 1773, p. 3.—*La Perouſe, Jour. de Phyſ.* XVI. 156. and XV. 67. and XXVIII. 68.—*Sage, Mem. Par.* 1785, 235.

From the analyſis of Vauquelin, it appears that it is compoſed of
50.0 white oxyd of manganeſe,
33.7 oxygen,
14.7 barytes,
1.2 ſilica,
.4 charcoal.

100.0 ¶

¶ *Dolomieu, Jour. de Min.* N° xix. 42.

SPECIES 2. Grey ore of manganeſe.*

272
Grey ore of manganeſe.

This ore occurs both maſſive and diſſeminated; it is alſo ſometimes cryſtallized in ſlender four-ſided priſms or needles.

* *Kirwan,* ii. 291.

Colour uſually duſky ſteel grey; ſometimes whitiſh grey, or reddiſh grey. Streak and powder black. External luſtre 3 to 2; internal metallic, 2 to 1. Texture ſtriated or foliated. Hardneſs 4 to 5. Brittle. Sp. gr. from 4.073 † to 4.8165 ‡. Before the blow-pipe darkens: tinges borax reddiſh brown.

† *Vauquelin.*
‡ *Briſſon.*

A ſpecimen of oxyd of manganeſe from the mountains of Voſges, which probably belonged to this ſpecies, and which was analyſed by Vauquelin, was compoſed of
82 oxyd of manganeſe,
7 carbonat of lime,
6 ſilica,
5 water.

100 §

§ *Jour. de Min.* N° xvii. 13.

Sometimes it contains a little barytes and iron.

SPECIES 3. Black or brown ore of manganeſe.*

273
Black or brown ore of manganeſe.

* *Kirwan,* ii. 292—*Wedgewood, Phil. Tranſ.* lxxiii. 284.

This ore is found ſometimes in the ſtate of powder, and ſometimes indurated in amorphous maſſes of various figures. Colour either black, ſometimes with a ſhade of blue or brown; or reddiſh brown. Streak of the harder ſorts metallic; of the others, black. Luſtre 0 to 1; internal (when it is indurated), metallic. Texture compact. Hardneſs 5 to 7. Sp. gr. 3.7076 to 3.9039; that of the powdery ſometimes only 2. Before the blow-pipe it exhibits the ſame phenomena as the laſt ſpecies.

A ſpecimen of this ore, analyſed by Weſtrum, contained
45.00 manganeſe,
14.00 oxyd of iron,
11.00 ſilica,
7 25 alumina,
2.00 lime,
1.50 oxyd of copper,
18.00 air and water.

98.75

GENUS II. SALTS OF MANGANESE.

274
G. II. Salts. Carbonat of manganeſe.

SPECIES. 1. Carbonat of manganeſe †.

White ore of manganeſe.

† *Kirwan,* ii. 297.

This ſpecies occurs in Sweden, Norway, and Tranſylvania. It is either in the form of looſe ſcales, or maſſive, or cryſtallized in needles.

Colour white, or reddiſh white. Texture either radiated or ſcaly. Luſtre of the ſcaly 2. Tranſparency 1 to 2. Hardneſs of the maſſive 6 to 9. Sp. gr. 2.794. Effervesces with mineral acids. Heated to redneſs, blackens. Tinges borax violet.

SPECIES 2. Red ore of manganeſe †.

Carbonat of manganeſe and iron.

275
Red ore of manganeſe.

† *Kirwan,* ii. 297—*Napion, Mem. Turin,* iv. 303.

This ſpecies has been found in Piedmont and in the Pyrenees. It is ſometimes in powder, ſometimes maſſive, ſometimes cryſtallized in rhomboidal priſms or needles.

Colour pale roſy red, mixed with white. Powder nearly white. Luſtre 0. Tranſparency 1. Hardneſs 8. Sp. gr. 3.233. Effervesces with nitric and muriatic acids. When heated to redneſs becomes reddiſh brown. Tinges borax red.

A ſpecimen, analyſed by Ruprecht, contained
55 ſilica,
35 oxyd of manganeſe,
7 oxyd of iron,
1.5 alumina.

98.5 §

§ *Jour. de Phyſ.* xxxi. 22.

ORDER XVI. ORES OF TUNGSTEN.

As no eaſy method has hitherto been diſcovered of reducing tungſten to a metallic ſtate, we need not be ſurprized that it has been applied to no uſe. Ores of tungſten are by no means common. They have hitherto been found only in the primitive mountains. Their gangue is commonly quartz. They very often accompany tin ores.

GENUS I. OXYDS OF TUNGSTEN.

SPECIES I. Wolfram (R).

Oxyds of tungſten, iron, and *manganeſe—Tungſtat of iron* and *manganeſe.*

276
G. I. Oxyds. Wolfram.

This ſpecies is found in different parts of Germany, in Sweden, Britain, France, and Spain; and is almoſt conſtantly accompanied by ores of tin. It occurs both maſſive and cryſtallized. The primitive form of its cryſtals, according to the obſervations of Mr Hauy, is a rectangular parallelopiped ‡, whoſe length is 8.66, whoſe breadth is 5, and thickneſs 4.33.* It is not common, however, to find cryſtals of this perfect form; in many caſes, the angles, and ſometimes the edges, of the cryſtal are wanting ‡; owing, as Mr Hauy has ſhewn, to the ſuperpoſition of plates, whoſe edges or angles decreaſe according to a certain law †.

‡ Fig. 42.
* *Jour. de Min.* N° xix. 8.
‡ Fig. 43.
† *Jour. de Min.* N° xix. 8.

Colour brown or browniſh black. Streak reddiſh brown. Powder ſtains paper with the ſame colour. Luſtre external, 2; internal, 2 to 3; nearly metallic. Texture foliated. Eaſily ſeparated into plates by percuſſion. Hardneſs 6 to 8. Sp. gr. from 7.006 * to 7.333 †. Moderately electric by communication. Not magnetic. Infuſible by the blow-pipe. Forms with borax a greeniſh globule, and with microcoſmic ſalt a tranſparent globule of a deep red ¶.

* *Kirwan.*
† *Hauy.*

The ſpecimen of this ore examined by Meſſrs d'Elhuyarts, was compoſed of 65 oxyd of tungſten,
22 oxyd of manganeſe,
13 oxyd of iron.

100

¶ *Vauquelin, Jour. de Min.* N° xix. 11.

Another

(R) *Kirw.* II. 316.—*De Luyart, Mem. Thoulouſe,* II. 141.—*Gmelin, Crell's Jour.* Engliſh tranſ. III. 127, 205, and 293.—*La Perouſe Jour. de Min.* N° IV. p. 23.

Ores of Molybdenum.

Another ſpecimen from Pays le Mines in France, analyſed by Vauquelin and Hecht, contained

67.00 oxyd of tungſten,
18.00 black oxyd of iron,
6.25 black oxyd of mangaueſe,
1.50 ſilica,
7.25 oxyd of the iron and manganeſe.

100.00 §

§ Vauquelin, Jour. de Min. N° xix. 11.

277 G. II. Salts. Tungſtat of lime.

GENUS II. SALTS OF TUNGSTEN.

SPECIES 1. Tungſtat of lime (s).

Tungſten.

This ore, which is now exceedingly ſcarce, has hitherto been found only in Sweden and Germany. It is either maſſive or cryſtallized; and, according to Hauy, the primitive form of its cryſtals is the octobedron †.

† Jour. de Min. N° xxxiii. 657.

Colour yellowiſh white or grey. Luſtre 3 to 2. Tranſparency 2 to 3. Texture foliated. Hardneſs 6 to 9. Sp. gr. 5.8 to 6.0665. Becomes yellow when digeſted with nitric or muriatic acids. Infuſible by the blow-pipe. With borax forms a colourleſs glaſs, unleſs the borax exceed, and then it is brown. With microcoſmic ſalt it forms a blue glaſs, which loſes its colour by the yellow flame, but recovers it in the blue flame ‡.

‡ Scheele and Bergman.

It is compoſed of about 70 oxyd of tungſten,
30 lime,

100

with a little ſilica and iron §.

§ Scheele.

278 Brown tungſtat.

SPECIES 2. Brown tungſtat.

This ore is found in Cornwal, and is either maſſive or compoſed of ſmall cryſtalline grains.

Colour grey, variegated with yellow and brown. Luſtre 2, waxy. Hardneſs 6 to 7. Sp. gr. 5.57. Its powder becomes yellow when digeſted in aqua regia.

According to Klaproth, it is compoſed of

88 oxyd of tungſten,
11.5 lime.

99.5

ORDER XVII. ORES OF MOLYBDENUM.

If ever molybdenum be found in abundance, it will probably be uſeful in dyeing and painting. At preſent it is very ſcarce, having only been found in Sweden, Germany, Carniola, and among the Alpes. Like tin and tungſten, it affects the primitive mountains.

279 G. I. Sulphuret. Common ſulphuret.

GENUS I. SULPHURET OF MOLYBDENUM.

SPECIES 1. Common ſulphuret (T).

Molybdena.

This ore, which is the only ſpecies of molybdenum ore at preſent known, is found commonly maſſive; ſometimes, however, it is cryſtallized in hexahedral tables.

Colour light lead grey; ſometimes with a ſhade of red. Streak bluiſh grey, metallic. Powder bluiſh. Luſtre metallic, 3 to 2. Texture foliated. Lamellæ ſlightly flexible. Hardneſs 4. Sp. gr. 4.569* to 4.7385 †. Feels greaſy; ſtains the fingers. Marks bluiſh black. A piece of reſin rubbed with this mineral becomes poſitively electric ‡. Inſoluble in ſulphuric and muriatic acids; but in a boiling heat colours them green. Effervefces with warm nitric acid, leaving a grey oxyd undiſſolved. Before the blow-pipe, on a ſilver ſpoon, emits a white ſmoke, which condenſes into a white powder, which becomes blue in the internal, and loſes its colour in the external, flame. Scarcely affected by borax or microcoſmic ſalt. Effervefces with ſoda, and gives it a reddiſh pearl colour.

* Kirwan.
† Briſſon.
‡ Hauy, Jour. de Min. N° xix. 70.

Metallic Ores.

Compoſed of about 60 molybdenum,
40 ſulphur.

100 *

* Klaproth.

ORDER XVIII. ORES OF URANIUM.

URANIUM has hitherto been found only in Germany, and has not been applied to any uſe. The only two mines where it has occurred are in the primitive mountains.

280 G. I. Oxyds. Sulphuret of uranium.

GENUS I. OXYDS OF URANIUM.

SPECIES 1. Sulphuret of uranium †.

Pechblende.

This ore, which has been found at Johanngeorgenſtadt in Saxony, and Joachimſthal in Bohemia, is either maſſive or ſtratified with other minerals.

† Kirwan, ii. 305.

Colour black or browniſh black; ſometimes with a ſhade of grey or blue. Streak darker. Powder opaque and black. Luſtre ſemimetallic, from 3 to 1. Fracture conchoidal. Hardneſs 7 to 8. Very brittle. Sp. gr. from 6.3785‡, to 7.5, and even higher §. Imperfectly ſoluble in ſulphuric and muriatic acids; perfectly in nitric acid and aqua regia. Solution wine yellow. Infuſible with alkalies in a crucible: infuſible by the blow-pipe *per ſe*. With borax and ſoda forms a grey opaque ſlag; with microcoſmic ſalt, a green glaſs.

‡ Morveau, Jour. de Min. N° xxxii. 610.
§ Klaproth, Beiträge, ii. 197.

Compoſed of oxyd of uranium and ſulphur, and mixed with iron and ſilica, and ſometimes lead.

A ſpecimen of this ore from Joachimſthal, analyſed lately by Klaproth, contained

86.5 uranium,
6.0 ſulphuret of lead,
5.0 ſilica,
2 5 oxyd of iron,

100 0 *

* Beiträge, ii. 221.

281 Yellow oxyd of uranium.

SPECIES 2. Yellow oxyd of uranium ‡.

Uranitic ochre.

This ore is generally found on the ſurface of the laſt ſpecies at Johanngeorgenſtadt, and is either maſſive or in powder.

‡ Kirwan, ii. 303.

Colour yellow, red, or brown. Streak of the yellow ſorts yellow; of the red, orange yellow. Luſtre 0. Slightly ſtains the fingers. Feels meagre. Texture earthy. Hardneſs 3 to 4. Sp. gr. 3.2438 ‖. Infuſible by the blow-pipe; but in a ſtrong heat becomes browniſh grey.

‖ Hauy, Jour. de Min. ibid.

Compoſed of oxyd of uranium and oxyd of iron.

GENUS

(s) *Kirw.* II. 314.—*Scheele's Works* (French tranſlation), II. 81.—*Bergman*, *ibid.* p. 94.—*Crell*, *Chem. Annalen*. 1784. 2 *Band* 195.

(T) *Kirw.* II. 322.—*Scheele's Works* (French tranſlation), I. 236.—*Pelletier*, *Jour. de Phyſ.* XXVII. 434.—*Ilſemann*, *ibid.* XXXIII. 292.—*Sage*. *ibid.* 389.—*Klaproth* and *Modeer*, *Ann. de Chim.* III. 120.

Genus II. SALTS OF URANIUM.

SPECIES 1. Carbonat of uranium¶.

282 G. II. Salts. Carbonat of uranium. This ſubſtance is alſo found at Johanngeorgenſtadt, and near Eibenſtock and Rheinbreidenbach§. It is ſometimes amorphous, but more commonly cryſtallized. Its cryſtals are ſquare plates, octohedrons, and ſix-ſided priſms.

Colour green; ſometimes nearly white; ſometimes, though rarely, yellow. Streak greeniſh white. Luſtre 3 to 2; internal, 2; ſometimes pearly; ſometimes nearly metallic. Tranſparency 2 to 3. Texture foliated. Hardneſs 5 to 6. Brittle. Soluble in nitric acid without efferveſcence. Infuſible by alkalies.

Compoſed of carbonat of uranium, with ſome oxyd of copper. When its colour is yellow it contains no copper.

ORDER XIX. ORES OF TITANIUM.

TITANIUM has been known for ſo ſhort a time, and its properties are yet ſo imperfectly aſcertained, that many of its uſes muſt remain to be diſcovered. Its oxyd, as we learn from Mr Darcet, has been employed in painting on porcelain*. Hitherto it has been found only in the primitive mountains, the Crapacks†, the Alpes (v), and the Pyrenees‡. It has been found alſo in Brittany|| and in Cornwal.

Genus I. OXYDS OF TITANIUM.

SPECIES 1. Red oxyd of Titanium.

Red ſhorl—Sagenite.

283 G. I. Oxds. Red oxyd of titanium. This ore has been found in Hungary, the Pyrenees, the Alpes, and in Brittany in France. It is generally cryſtallized. The primitive form of its cryſtals, according to the obſervations of Mr Hauy, is a rectangular priſm, whoſe baſe is a ſquare; and the form of its molecules is a triangular priſm, whoſe baſe is a right angled iſoſceles triangle, and the height is to any of the ſides of the baſe about the right angle as $\sqrt{12}$ to $\sqrt{5}$, or nearly as 3 : 2¶. Sometimes the cryſtals of titanium are ſix-ſided, and ſometimes four-ſided, priſms, and often they are implicated together‡.

Colour red or browniſh red. Powder brick or orange red. Luſtre 3. Tranſparency commonly 0; ſometimes 1. Texture foliated. Hardneſs 9. Brittle. Sp. gr. from 4.18* to 4.2469†. Not affected by the mineral acids. When fuſed with carbonat of potaſs, and diluted with water, a white powder precipitates, heavier than the titanium employed. Before the blow-pipe it does not melt, but becomes opaque and brown. With microcoſmic ſalt it forms a globule of glaſs, which appears black; but its fragments are violet. With borax it forms a deep yellow glaſs, with a tint of brown. With ſoda it divides and mixes, but does not form a tranſparent glaſs.

When pure, it is compoſed entirely of oxyd of titanium.

SPECIES 2. Menachanite (x).

Oxyd of titanium combined with iron.

284 Menachanite. This ſubſtance has been found abundantly in the valley of Menachan in Cornwal; and hence was called menachanite by Mr Gregor, the diſcoverer of it. It is in ſmall grains, like gunpowder, of no determinate ſhape, and mixed with a fine grey ſand. Colour black. Eaſily pulverized. Powder attracted by the magnet. Sp. gr. 4.427. Does not detonate with nitre. With two parts of fixed alkali it melts into an olive coloured maſs, from which nitric acid precipitates a white powder. The mineral acids only extract from it a little iron. Diluted ſulphuric acid, mixed with the powder, in ſuch a proportion that the maſs is not too liquid, and then evaporated to dryneſs, produces a blue coloured maſs. Before the blow-pipe does not decrepitate nor melt. It tinges microcoſmic ſalt green; but the colour becomes brown on cooling: yet microcoſmic ſalt does not diſſolve it. Soluble in borax, and alters its colour in the ſame manner.

According to the analyſis of Mr Gregor, it is compoſed of

46	oxyd of iron,
45	oxyd of titanium.
91	with ſome ſilica and manganeſe†.

According to Mr Klaproth's analyſis, it is compoſed of

51.00	oxyd of iron,
45.25	oxyd of titanium,
3.50	ſilica,
.25	oxyd of manganeſe.
100.00‡	

A mineral, nearly of the ſame nature with the one juſt deſcribed, has been found in Bavaria. Its ſpecific gravity, however, is only 3.7. According to the analyſis of Vauquelin and Hecht, it is compoſed of

49	oxyd of titanium,
35	iron,
2	manganeſe,
14	oxygen combined with the iron and manganeſe.
100§	

SPECIES 3. Calcareo ſiliceous ore of titanium.

Oxyd of titanium combined with lime and ſilica—Titanite†.

285 Calcareo ſiliceous ore of titanium. This ore has hitherto been found only near Paſſau. It was diſcovered by Profeſſor Hunger. It is ſometimes maſſive, but more commonly cryſtallized in four-ſided priſms, not longer than one-fourth of an inch.

Colour reddiſh, yellowiſh, or blackiſh brown; ſometimes whitiſh grey. Powder whitiſh grey. Luſtre waxy or nearly metallic, 2 to 3. Tranſparency from 0 to 2. Texture foliated. Hardneſs 9 or more. Brittle. Sp. gr. 3.510. Muriatic acid, by repeated digeſtion, diſſolves one-third of it. Ammonia precipitates from this ſolution a clammy yellowiſh ſubſtance. Infuſible by the blow-pipe, and alſo in a clay crucible; but in charcoal is converted into a black opaque porous ſlag.

According to the analyſis of Klaproth, it is compoſed of

33	oxyd of titanium,
35	ſilica,
33	lime.
101	

ORDER

¶ *Kirwan*, ii. 304.

§ *Gmelin*.

* *Jour. de Min.* N° xv. 27.

† *Ibid.* N° xii. 51.

‡ *Jour. de Min.* N° xxxii. 614.

|| *Ibid.*

¶ *Jour. de Min.* N° xv. 28. and xxxii. 615.

‡ Fig. 44.

* *Klaproth.*

† *Vauquelin* and *Hecht.*

† *M'Gregor Jour. de Phyſ.* xxxix. 72. 152.

‡ *Beiträge*, ii. 231.

§ *Jour. de Min.* N° xix. 57.

† *Kirwan*, ii. 331.

(v) *Dolomieu*, *Jour. de Min.* N° XLII. 431. and *Sauſſure*, *Voyages*, N° 1894.

(x) *Kirw.* II. 326.—*Gregor*, *Jour. de Phyſ.* XXXIX. 72. and 152.—*Schmeiſſer*, *Crell's Annals* (Engliſh tranſlation), III. 252.

ORDER XX. ORES OF TELLURIUM.

Hitherto tellurium has only been found in Tranſylvania. It occurs in three different mines; that of Fatzbay, Offenbanya, and Nagyag, which are conſidered as gold mines, becauſe they contain leſs or more of that metal. Its gangue is commonly quartz.

286 G. I. Alloys. White gold ore of Fatzbay.

Genus I. ALLOYS OF TELLURIUM.

SPECIES 1. White gold ore of Fatzbay.

Alloy of tellurium and iron, with ſome gold.

This ſpecies is generally maſſive. Its colour is between tin white and lead grey. Luſtre conſiderable, metallic. Texture granular*.

According to Klaproth's analyſis, it is compoſed of

72.0 iron,
25.5 tellurium,
2.5 gold.

100.0†

287 Graphic golden ore of Offenbanya.

SPECIES 2. Graphic golden ore of Offenbanya.

Tellurium alloyed with gold and ſilver.

This ore is compoſed of flat priſmatic cryſtals; the arrangement of which has ſome reſemblance to Turkiſh letters. Hence the name of the ore.

Colour tin white, with a tinge of braſs yellow‡. Luſtre metallic, 3. Hardneſs 4 to 5. Brittle. Sp. gr. 5.723. Before the blow-pipe decrepitates, and melts like lead. Burns with a lively brown flame and diſagreeable ſmell, and at laſt vaniſhes in a white ſmoke, leaving only a whitiſh earth‖.

According to Klaproth's analyſis, is is compoſed of

60 tellurium,
30 gold,
10 ſilver.

100§

The yellow gold ore of Nagyag would belong to this ſpecies were it not that it contains lead. Its compoſition, according to Klaproth's analyſis, is as follows:

45.0 tellurium,
27.0 gold,
19.5 lead,
8.5 ſilver.

100.0 and an atom of ſulphur*.

288 Grey foliated gold ore of Nagyag.

SPECIES 3. Grey foliated gold ore of Nagyag.

This ore is found in plates, of different degrees of thickneſs, adhering to one another, but eaſily ſeparable: theſe are ſometimes hexahedral, and often accumulated ſo as to leave cells between them.

Colour deep lead grey, paſſing to iron black, ſpotted. Luſtre metallic, moderate. Texture foliated; leaves ſlightly flexible†. Hardneſs 6. Sp. gr. 8.919. Stains the fingers. Soluble in acids with effervefcence‡.

According to Klaproth, it is compoſed of

50.0 lead,
33.0 tellurium,
8.5 gold,
7.5 ſulphur,
1.0 ſilver and copper.

100.0§

ORDER XXI. ORES OF CHROMUM.

Chromum has hitherto been found in too ſmall quantities for its extenſive application to the arts. Whenever it becomes plentiful, its properties will render it of great importance both to the dyer and painter. Nature has uſed it to colour ſome of her moſt beautiful mineral productions: And can art copy after a better model? Hitherto it has been found only in two places, near Ekaterinbourg in Siberia, and in the department of the Var in France. In the firſt of theſe places, and probably alſo in the ſecond, its gangue is quartz.

289 G. I. Salts. Chromat of lead.

Genus I. SALTS OF CHROMUM.

SPECIES 1. Chromat of lead.

Red lead ore of Siberia.

This ſingular mineral, which has now become ſcarce, is found in the gold mines of Bereſof near Ekaterinbourg in Siberia, cryſtallized in four-ſided priſms, ſometimes terminated by four-ſided pyramids, ſometimes not.

Colour red, with a ſhade of yellow. Streak and powder a beautiful orange yellow. Luſtre from 2 to 3. Tranſparency 2 to 3. Structure foliated. Texture compact. Fracture uneven. Hardneſs 5 to 4. Sp. gr. 6.0269† to 5.75‡. Does not effervefce with acids. Before the blow-pipe decrepitates; ſome lead is reduced, and the mineral is converted to a black ſlag, which tinges borax green.

According to the analyſis of Vauquelin, it is compoſed of

65.12 oxyd of lead,
34.88 chromic acid.

100.00‖.

290 Chromat of iron.

SPECIES 2. Chromat of iron.

This mineral, which has been found only near Gaſſin in the department of Var in France, is in irregular maſſes.

Colour brown, not unlike that of brown blende. Luſtre metallic. Hardneſs moderate. Sp. gr. 4.0326. Melts with difficulty before the blow-pipe; to borax it communicates a dirty green. Inſoluble in nitric acid. Melted with potaſs, and diſſolved in water, the ſolution aſſumes a beautiful orange yellow colour.

It is compoſed of 63.6 chromic acid,
36.0 oxyd of iron.

99.6†

CHAP. IV. OF THE CHEMICAL ANALYSIS OF MINERALS.

291 Analyſis of minerals.

The progreſs which the art of analyſing minerals has made within theſe laſt twenty years is truly aſtoniſhing. To ſeparate five or ſix ſubſtances intimately combined together, to exhibit each of them ſeparately, to aſcertain the preciſe quantity of each, and even to detect the preſence and the weight of ſubſtances which do not approach $\frac{1}{100}$th part of the compound, would, at no very remote period, have been conſidered as a hopeleſs, if not an impoſſible, taſk; yet this can now be done with the moſt rigid accuracy.

292 Begun by Margraff.

The firſt perſon who undertook the analyſis of minerals was Margraff of Berlin. His attempts were indeed rude; but their importance was ſoon perceived by other chemiſts, particularly by Bergman and Scheele, whoſe induſtry and addreſs brought the art of analyſing minerals to a conſiderable degree of perfection.

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* Ann. de Chim. xxv. 327.

† Ibid. 280.

‡ Ann. de Chim. xxv. 328.

‖ De Born, Kirwan's Min. ii. 101.

§ Ann. de Chim. xxv. 280.

* Ibid.

† Klaproth, Ann. de Chim. xxv. 329.

‡ De Born, Kirwan's Min. ii. 99.

§ Ann. de Chim. ibid. 280.

† Briſſon.

‡ Bindheim.

‖ Jour. de Min. N° xxxiv. 760.

† Taſſaert, Ann. de Chim. xxxi. 220.

293 Improved by Klaproth.

294 And other chemiſts.

But their methods, though they had very conſiderable merit, and, conſidering the ſtate of the ſcience, are wonderful proofs of the genius of the inventors, were often tedious and uncertain, and could not, in all caſes be applied with confidence. Theſe defects were perceived by Mr Klaproth of Berlin, who applied himſelf to the analyſis of minerals with a perſevering induſtry which nothing could fatigue, and an ingenuity and accuracy which nothing could perplex. He corrected what was wrong, and ſupplied what was wanting, in the analytical method; invented new proceſſes, diſcovered new inſtruments; and it is to his labours, more than to thoſe of any other chemiſt, that the degree of perfection, to which the analyſis of minerals has attained, is to be aſcribed. Many improvements, however, were introduced by other chemiſts, eſpecially by Mr. Vauquelin, whoſe analyſes in point of accuracy and ingenuity rival thoſe of Klaproth himſelf.

We ſhall, in this chapter, give a ſhort deſcription of the moſt perfect method of analyſing minerals, as far as we are acquainted with it. We ſhall divide the chapter into four ſections. In the firſt, we ſhall give an account of the inſtruments uſed in analyſes; in the ſecond, we ſhall treat of the method of analyſing ſtones; in the third, of analyſing combuſtibles; and in the fourth, of the analyſes of ores.

SECT. I. *Of the Inſtruments of Analyſes.*

295 Method of obtaining chemical agents pure.

I. THE chemical agents, by means of which the analyſis of minerals is accompliſhed, ought to be prepared with the greateſt care, becauſe upon their purity the exactneſs of the operation entirely depends. Theſe agents are the three alkalies, both pure and combined with carbonic acid; the ſulphuric, nitric, and muriatic acids; hydroſulphuret of potaſs and ſulphurated hydrogen gas diſſolved in water; pruſſic alkali, and a few neutral ſalts.

1. Potaſs and ſoda may be obtained pure, either by means of alcohol, or by the method deſcribed in the article CHEMISTRY, n° 372. *Suppl.*. Theſe alkalies are known to be pure when their ſolution in pure water occaſions no precipitate in lime and barytic water; when the precipitate which it produces in a ſolution of ſilver is completely diſſolved by nitric acid; and, laſtly, when ſaturated with carbonic acid it depoſits no ſilica.

2. Ammonia is procured by diſtilling one part of muriat of ammonia with two parts of quicklime, and receiving the gas in a diſh containing a quantity of pure water, equal in weight to the muriat employed. Its purity is known by the ſame teſts which aſcertain the purity of fixed alkalies.

3. The carbonats of potaſs and ſoda may be formed by diſſolving the potaſs and ſoda of commerce in pure water, ſaturating the ſolution with carbonic acid, and cryſtallizing them repeatedly. When pure, theſe cryſtals effloreſce in the air; and the precipitate which they occaſion in ſolutions of barytes and of ſilver is completely ſoluble in nitric acid. Carbonat of ammonia is obtained by diſtilling together one part of muriat of ammonia and two parts of carbonat of lime.

4. The ſulphuric acid of commerce often contains nitric acid, potaſs, lead, &c. It may be purified by diſtillation in a low cucurbite. The firſt portion, when it comes over, muſt be ſet aſide; it contains the nitric acid. The other impurities remain behind in the cucurbite. Sulphuric acid, when pure, diſſolves indigo without altering its colour, does not attack mercury while cold, and cauſes no precipitate in pure alkaline ſolutions.

5. Nitric acid often contains both ſulphuric and muriatic acids. It is eaſily purified by throwing into it about three parts of litharge in fine powder for every 100 parts of the acid, allowing the mixture to remain for 24 hours, ſhaking it occaſionally, and then diſtilling it. The ſulphuric and muriatic acids combine with the lead, and remain behind in the retort. Pure nitric acid occaſions no precipitate in the ſolutions of barytes and ſilver.

6. The muriatic acid of commerce uſually contains ſulphuric acid, oxymuriatic acid, and oxyd of iron. It may be purified by diſtillation with a little muriat of ſoda; taking care to ſet aſide the firſt portion which comes over. When pure it cauſes no precipitate in the ſolution of barytes, nor of pure alkalies, and does not attack mercury while cold.

7. Hydroſulphuret of potaſs is made by ſaturating a ſolution of pure potaſs with ſulphurated hydrogen gas; and water may be ſaturated with ſulphurated hydrogen gas in the ſame manner. See CHEMISTRY, n° 857. *Suppl.*

8. The method of preparing pruſſic alkali, oxalic acid, and the other ſubſtances uſed in analyſes, has been already deſcribed in the article CHEMISTRY, *Suppl.* it is unneceſſary therefore to repeat it here.

296 How to reduce the mineral to powder.

II. Before a mineral is ſubmitted to analyſis, it ought to be reduced to an impalpable powder. This is by no means an eaſy taſk when the ſtone is extremely hard. It ought to be raiſed to a bright red or white heat in a crucible, and then inſtantly thrown into cold water. This ſudden tranſition makes it crack and break into pieces. If theſe pieces are not ſmall enough, the operation may be repeated on each till they are reduced to the proper ſize. Theſe fragments are then to be beaten to ſmall pieces in a poliſhed ſteel mortar; the cavity of which ſhould be cylindrical, and the ſteel peſtle ſhould fit it exactly, in order to prevent any of the ſtone from eſcaping during the act of pounding. As ſoon as the ſtone is reduced to pretty ſmall pieces, it ought to be put into a mortar of rock cryſtal or flint, and reduced to a coarſe powder. This mortar ſhould be about four inches in diameter, and rather more than an inch in depth. The peſtle ſhould be formed of the ſame ſtone with the mortar, and care ſhould be taken to know exactly the ingredients of which this mortar is compoſed. Klaproth's mortar is of flint. We have given its analyſis in n° 32, of this article.

When the ſtone has been reduced to a coarſe powder, a certain quantity, whoſe weight is known exactly, 100 grains for inſtance, ought to be taken and reduced to as fine a powder as poſſible. This is beſt done by pounding ſmall quantities of it at once, not exceeding 10 grains. The powder is as fine as poſſible when it feels ſoft, adheres together, and as it were forms a cake under the peſtle. It ought then to be weighed exactly. It will almoſt always be found heavier after being pounded than it was before; owing to a certain quantity of the ſubſtance of the mortar which has been rubbed off during the grinding and mixed with the powder,

der. This additional weight muſt be carefully noted; and after the analyſis, a portion of the ingredients of the mortar, correſponding to it, muſt be ſubtracted.

297 Chemical diſhes.

III. It is neceſſary to have a crucible of pure ſilver, or, what is far preferable, of platinum, capable of holding rather more than ſeven cubic inches of water, and provided with a cover of the ſame metal. There ſhould alſo be ready a ſpatula of the ſame metal about four inches long.

The diſhes in which the ſolutions, evaporations, &c. are performed, ought to be of glaſs or porcelain. Thoſe of porcelain are cheaper, becauſe they are not ſo apt to break. Thoſe which Mr Vauquelin uſes are of porcelain; they are ſections of ſpheres, and are glazed both within and without, except that part of the bottom which is immediately expoſed to the fire.

Sect. II. *Analyſis of ſtones* (y).

298 Ingredients of ſtones.

The only ſubſtances which enter into the compoſition of the ſimple ſtones, as far at leaſt as analyſis has diſcovered, are the ſix earths, ſilica, alumina, zirconia, glucina, lime, and magneſia; and the oxyds of iron, manganeſe, nickel, chromum, and copper (z). Seldom more than four or five of theſe ſubſtances are found combined together in the ſame ſtone: we ſhall ſuppoſe, however, in order to prevent unneceſſary repetitions, that they are all contained in the mineral which we are going to analyſe.

299 Method of decompoſing ſtones.

Let 100 or 200 grains of the ſtone to be analyſed, previouſly reduced to a fine powder, be mixed with three times its weight of pure potaſs and a little water, and expoſed in the ſilver or platinum crucible to a ſtrong heat. The heat ſhould at firſt be applied ſlowly, and the matter ſhould be conſtantly ſtirred, to prevent the potaſs from ſwelling and throwing any part out of the crucible. When the whole water is evaporated, the mixture ſhould be kept for half an hour or three quarters in a ſtrong red heat.

If the matter in the crucible melts completely, and appears as liquid as water, we may be certain that the ſtone which we are analyſing conſiſts chiefly of ſilica; if it remains opaque, and of the conſiſtence of paſte, the other earths are moſt abundant; if it remains in the form of a powder, alumina is the prevalent earth. If the matter in the crucible be of a dark or browniſh red colour, it contains oxyd of iron; if it is graſs green, manganeſe is preſent: if it is yellowiſh green, it contains chromum.

When the crucible has been taken from the fire and wiped on the outſide, it is to be placed in a capſule of porcelain, and filled with water. This water is to be renewed from time to time till all the matter is detached from the crucible. The water diſſolves a part of the combination of the alkali with the ſilica and alumina of the ſtone, and if a ſufficient quantity were uſed, it would diſſolve the whole of that combination.

Muriatic acid is now to be poured in till the whole of the matter is diſſolved. At firſt a flaky precipitate appears, becauſe the acid combines with the alkali which kept it in ſolution. Then an effervеſcence takes place, owing to the decompoſition of ſome carbonat of potaſs formed during the fuſion. At the ſame time the flaky precipitate is rediſſolved; as is alſo that part of the matter which, not having been diſſolved in the water, had remained at the bottom of the diſh in the form of a powder. This powder, if it conſiſts only of ſilica and alumina, diſſolves without effervеſcence; but if it contains lime, an effervеſcence takes place.

If this ſolution in muriatic acid be colourleſs, we may conclude that it contains no metallic oxyd, or only a very ſmall portion; if its colour be purpliſh red, it contains mangaueſe; orange red indicates the preſence of iron; and golden yellow the preſence of chromum.

This ſolution is to be poured into a capſule of porcelain, covered with paper, and evaporated to dryneſs in a ſand bath. When the evaporation is drawing towards its completion, the liquor aſſumes the form of jelly. It muſt then be ſtirred conſtantly with a glaſs or porcelain rod, in order to facilitate the diſengagement of the acid and water, and to prevent one part of the matter from being too much, and another not ſufficiently dried. Without this precaution, the ſilica and alumina would not be completely ſeparated from each other.

300 How the ſilica is ſeparated,

When the matter is reduced almoſt to a dry powder, a large quantity of pure water is to be poured on it; and, after expoſure to a ſlight heat, the whole is to be poured on a filter. The powder which remains upon the filter is to be waſhed repeatedly, till the water with which it has been waſhed ceaſes to precipitate ſilver from its ſolutions. This powder is the whole of the *ſilica* which the ſtone that we are analyſing contained. It muſt firſt be dried between folds of blotting paper, then heated red hot in a platinum or ſilver crucible, and weighed while it is yet warm. It ought to be a fine powder, of a white colour, not adhering to the fingers, and entirely ſoluble in acids. If it be coloured, it is contaminated with ſome metallic oxyd; and ſhews, that the evaporation to dryneſs has been performed at too high a temperature. To ſeparate this oxyd, the ſilica muſt be boiled with an acid and then waſhed and dried as before. The acid ſolution muſt be added to the water which paſſed through the filter, and which we ſhall denominate A.

The watery ſolution A is to be evaporated till its quantity does not exceed 30 cubic inches, or nearly an Engliſh pint. A ſolution of carbonat of potaſs is then to be poured into it till no more matter precipitates. It ought to be boiled a few moments to enable all the precipitate to fall to the bottom. When the whole of the precipitate has collected at the bottom, the ſupernatant liquid is to be decanted off; and water being ſubſtituted in its place, the precipitate and water are to be thrown upon a filter. When the water has run off, the filter with the precipitate upon it is to be placed between folds of blotting paper. When the precipitate has acquired ſome conſiſtence, it is to be carefully collected by an ivory knife, mixed with a ſolution of pure potaſs, and boiled in a porcelain capſule. If any

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(p) Part of this ſection is to be conſidered as an abſtract of a treatiſe of Vauquelin on the analyſis of ſtones, publiſhed in the *Annales de Chimie*, Vol. XXX. p. 66.

(z) Barytes has alſo been diſcovered in one ſingle ſtone, the *ſtaurolite*; but its preſence in ſtones is ſo uncommon, that it can ſcarcely be looked for. The method of detecting it ſhall be noticed afterwards.

alumina or glucina be preſent, they will be diſſolved in the potaſs; while the other ſubſtances remain untouched in the form of a powder, which we ſhall call B.

301 And the alumina,

Into the ſolution of potaſs as much acid muſt be poured as will not only ſaturate the potaſs, but alſo completely rediſſolve any precipitate which may have at firſt appeared. Carbonat of ammonia is now to be added in ſuch quantity that the liquid ſhall taſte of it. By this addition the whole of the alumina will be precipitated in white flakes, and the glucina will remain diſſolved, provided the quantity of carbonat of ammonia uſed be not too ſmall. The liquid is now to be filtered, and the alumina which will remain on the filter is to be waſhed, dried, heated red hot, and then weighed. To ſee if it be really alumina, diſſolve it in ſulphuric acid, and add a ſufficient quantity of ſulphat or acetite of potaſs; if it be alumina, the whole of it will be converted into cryſtals of alum.

302 Glucina,

Let the liquid which has paſſed through the filter be boiled for ſome time, and the glucina, if it contains any, will be precipitated in a light powder, which may be dried and weighed. When pure, it is a fine, ſoft, very light, taſteleſs powder, which does not concrete when heated, as alumina does.

303 Lime,

The reſiduum B may contain lime, magneſia, and one or more metallic oxyds. Let it be diſſolved in weak ſulphuric acid, and the ſolution evaporated to dryneſs. Pour a ſmall quantity of water on it. The water will diſſolve the ſulphat of magneſia, and the metallic ſulphats; but the ſulphat of lime will remain undiſſolved. Let it be heated red hot in a crucible, and weighed. The lime amounts to 0.41 of the weight.

Let the ſolution containing the remaining ſulphats be diluted with a large quantity of water, let a ſmall exceſs of acid be added, and then let a ſaturated carbonat of potaſs be poured in. The oxyds of chromum, iron, and nickel, will be precipitated, and the magneſia and oxyd of mangameſe will remain diſſolved. The precipitate we ſhall call C.

304 Mangameſe,

Into the ſolution let a ſolution of hydroſulphuret of potaſs be poured, and the mangameſe will be precipitated in the ſtate of a hydroſulphuret. Let it be calcined in contact with air, and weighed.

305 Magneſia,

The magneſia may then be precipitated by pure potaſs, waſhed, expoſed to a red heat, and then weighed.

306 Chromum,

Let the reſiduum C be boiled repeatedly with nitric acid, then mixed with pure potaſs; and after being heated, let the liquid be decanted off. Let the precipitate, which conſiſts of the oxyds of iron and nickel, be waſhed with pure water; and let this water be added to the ſolution of the nitric acid and potaſs. That ſolution contains the chromum converted into an acid. Add to this ſolution an exceſs of muriatic acid, and evaporate till the liquid aſſumes a green colour; then add a pure alkali: The chromum precipitates in the ſtate of an oxyd, and may be dried, and weighed.

307 Iron,

Let the precipitate, conſiſting of the oxyds of iron and nickel, be diſſolved in muriatic acid; add an exceſs of ammonia: the oxyd of iron precipitates. Let it be waſhed, dried, and weighed.

308 And nickel.

Evaporate the ſolution, and the oxyd of nickel will alſo precipitate; and its weight may be aſcertained in the ſame manner with the other ingredients.

The weights of all the ingredients obtained are now to be added together, and their ſum total compared with the weight of the matter ſubmitted to analyſis. If the two are equal, or if they differ only by .03 or .04 parts, we may conclude that the analyſis has been properly performed: but if the loſs of weight be conſiderable, ſomething or other has been loſt. The analyſis muſt therefore be repeated with all poſſible care. If there is ſtill the ſame loſs of weight, we may conclude that the ſtone contains ſome ſubſtance, which has either evaporated by the heat, or is ſoluble in water.

309 Method of detecting volatile bodies.

A freſh portion of the ſtone muſt therefore be broken into ſmall pieces, and expoſed in a porcelain crucible to a ſtrong heat. If it contains water, or any other volatile ſubſtance, they will come over into the receiver; and their nature and weight may be aſcertained.

If nothing comes over into the receiver, or if what comes over is not equal to the weight wanting, we may conclude that the ſtone contains ſome ingredient which is ſoluble in water.

310 Method of aſcertaining whether ſtones contain potaſs

To diſcover whether it contains *potaſs*, let the ſtone, reduced to an impalpable powder, be boiled five or ſix times in ſucceſſion, with very ſtrong ſulphuric acid, applying a pretty ſtrong heat towards the end of the operation, in order to expel the exceſs of acid; but taking care that it be not ſtrong enough to decompoſe the ſalts which have been formed.

Water is now to be poured on, and the reſiduum, which does not diſſolve, is to be waſhed with water till it becomes taſteleſs. The watery ſolution is to be filtered, and evaporated to dryneſs, in order to drive off any exceſs of acid which may be preſent. The ſalts are to be again diſſolved in water; and the ſolution, after being boiled for a few moments, is to be filtered and evaporated to a conſiſtence proper for cryſtallizing. If the ſtone contains a ſufficient quantity of alumina, and if potaſs be preſent, cryſtals of alum will be formed; and the quantity of potaſs may be diſcovered by weighing them, it being nearly $\frac{1}{10}$th of their weight. If the ſtone does not contain alumina, or not in ſufficient quantity, a ſolution of pure alumina in ſulphuric acid muſt be added. Sometimes the alum, even when potaſs is preſent, does not appear for ſeveral days, or even weeks; and ſometimes, when a great quantity of alumina is preſent, if the ſolution has been too much concentrated by evaporation, the ſulphat of alumina prevents the alum from cryſtallizing at all. Care, therefore, muſt be taken to prevent this laſt ſource of error. The alum obtained may be diſſolved in water, and barytic water poured into it as long as any precipitate forms. The liquor is to be filtered, and evaporated to dryneſs. The reſiduum will conſiſt of potaſs and a little carbonat of potaſs. The potaſs may be diſſolved in a little water. This ſolution, evaporated to dryneſs, gives us the potaſs pure; which may be examined and weighed.

311 Or ſoda.

If no cryſtals of alum can be obtained, we muſt look for ſome other ſubſtance than potaſs. The ſtone, for inſtance, may contain ſoda. The preſence of this alkali may be diſcovered by decompoſing the ſolution in ſulphuric acid, already deſcribed, by means of ammonia. The liquid which remains is to be evaporated to dryneſs, and the reſiduum is to be calcined in a crucible. By this method, the ſulphat of ammonia will be volatilized, and the ſoda will remain. It may be rediſſolved in water, cryſtallized, and examined.

If ſulphuric acid does not attack the ſtone, as is often the caſe, it muſt be decompoſed by fuſion with ſoda, da, in the ſame manner as formerly directed with potaſs. The matter, after fuſion, is to be diluted with water, and then ſaturated with ſulphuric acid. The ſolution is to be evaporated to dryneſs, the reſiduum again diſſolved in water, and evaporated. Sulphat of ſoda will cryſtallize firſt; and by a ſecond evaporation, if the ſtone contains potaſs and alumina, cryſtals of alum will be depoſited.

The preſence of potaſs may be diſcovered, by mixing with a ſomewhat concentrated ſolution of muriat of platinum, the ſalt obtained, either by decompoſing the ſtone immediately by an acid, or by ſaturating with an acid the matter obtained by fuſing the ſtone with ſoda. If any potaſs be preſent, a very red precipitate will be formed. This precipitate is a triple ſalt, compoſed of potaſs, muriatic acid, and oxyd of platinum. Ammonia, indeed, produces the ſame precipitate; but ammonia has not hitherto been diſcovered in ſtones.

312 Analyſis of ſaline ſtones, In this manner may ſimple ſtones and aggregates be analyſed. As to ſaline ſtones, their analyſis muſt vary according to the acid which they contain. But almoſt all of them may be decompoſed by one or other of two methods; of each of which we ſhall give an example.

I. Analyſis of Carbonat of Strontites.

313 Of Carbonats, Klaproth analyſed this mineral by diſſolving 100 parts of it in diluted muriatic acid: during the ſolution, 30 parts of carbonic acid eſcaped. The ſolution cryſtallized in needles, and when diſſolved in alcohol, burnt with a purple flame. Therefore it contained ſtrontites. He diſſolved a grain of ſulphat of potaſs in ſix ounces of water, and let fall into it three drops of the muriatic ſolution. No precipitate appeared till next day. Therefore the ſolution contained no barytes; for if it had, a precipitate would have appeared immediately.

He then decompoſed the muriatic acid ſolution, by mixing it with carbonat of potaſs. Carbonat of ſtrontites precipitated. By the application of a ſtrong heat, the carbonic acid was driven off. The whole of the earth which remained was diſſolved in water. It cryſtallized; and when dried, weighed $69\frac{1}{2}$*.

II. Analyſis of Sulphat of Strontites.

Mr Vauquelin analyſed an impure ſpecimen of this mineral as follows:

314 Sulphats, On 200 parts of the mineral, diluted nitric acid was poured. A violent effervescence took place, and part of the mineral was diſſolved. The undiſſolved portion, after being heated red hot, weighed 167. Therefore 33 parts were diſſolved.

The nitric ſolution was evaporated to dryneſs: A reddiſh ſubſtance remained, which indicated the preſence of oxyd of iron. This ſubſtance was rediſſolved in water, and ſome ammonia mixed with it; a reddiſh precipitate appeared, which, when dried, weighed 1, and was oxyd of iron. The remainder of the ſolution was precipitated by carbonat of potaſs. The precipitate weighed, when dried, 20, and poſſeſſed the properties of carbonat of lime. Therefore 200 parts of this mineral contain 20 of carbonat of lime, 1 of oxyd of iron, and the remainder of the 33 parts he concluded to be water.

The 167 parts, which were inſoluble in nitric acid, were mixed with 500 parts of carbonat of potaſs, and 7000 parts of water, and boiled for a conſiderable time. The ſolution was then filtered, and the reſiduum waſhed and dried. The liquid ſcarcely effervesced with acids; but with barytes it produced a copious precipitate, totally indiſſoluble in muriatic acid. Therefore it contained ſulphuric acid.

The undiſſolved reſiduum, when dried, weighed 129 parts. It diſſolved completely in muriatic acid. The ſolution cryſtallized in needles; when diſſolved in alcohol, it burnt with a purple flame; and, in ſhort, had all the properties of muriat of ſtrontites. Therefore theſe 129 parts were carbonat of ſtrontites. Now, 100 parts of this carbonat contain 30 of carbonic acid; therefore 129 contain 38.7. Therefore the mineral muſt contain in 200 parts 90.3 of ſtrontites.

Now, the inſoluble reſiduum of 167 parts was pure ſulphat of ſtrontites; and we have ſeen that it contained 90.3 of ſtrontites. Therefore the ſulphuric acid muſt amount to 76.7 parts†.

Nearly in the ſame manner as in the firſt of theſe examples, may the analyſis of carbonat of lime and barytes be performed; and nearly in the ſame manner with the ſecond, we may analyſe the ſulphats of lime and barytes.

315 Phoſphats, Phoſphat of lime may be diſſolved in muriatic acid, and the lime precipitated by ſulphuric acid, and its quantity aſcertained by decompoſing the ſulphat of lime obtained. The liquid ſolution may be evaporated to the conſiſtence of honey, mixed with charcoal powder, and diſtilled in a ſtrong heat. By this means phoſphorus will be obtained. The impurities with which the phoſphat may be contaminated will partly remain undiſſolved, and be partly diſſolved, in muriatic acid. They may be detected and aſcertained by the rules laid down in the ſecond ſection of this chapter.

316 Fluats, The fluat of lime may be mixed with ſulphuric acid and diſtilled. The fluoric acid will come over in the form of gas, and its weight may be aſcertained. What remains in the retort, which will conſiſt chiefly of ſulphat of lime, may be analyſed by the rules already laid down.

317 And borats. The borat of lime may be diſſolved in nitric or ſulphuric acid. The ſolution may be evaporated to dryneſs, and the boracic acid ſeparated from the reſiduum by means of alcohol, which will diſſolve it without acting on any of the other ingredients. The remainder of the dry maſs may be analyſed by the rules laid down in Sect. II. of this Chapter.

SECT. III. *Of the Analyſis of Combuſtibles.*

THE only combuſtibles of whoſe analyſis it will be neceſſary to ſpeak are coals and ſulphur; for the method of analyſing the diamond and oil has already been given in the article CHEMISTRY, *Suppl.*

318 Earths of coal how examined. Coal is compoſed of carbon, bitumen, and ſome portion of earth. The earths may be detected by burning completely a portion of the coal to be analyſed. The aſhes which remain after incineration conſiſt of the earthy part. Their nature may be aſcertained by the rules laid down in Sect. II. of this Chapter.

For the method of aſcertaining the proportion of carbon and bitumen in coal, we are indebted to Mr Kirwan.

319 Method of detecting the relative proportions of charcoal and bitumen. When nitre is heated red hot, and charcoal is thrown on it, a violent detonation takes place; and if the quantity of charcoal be ſufficient, the nitre is completely decompoſed. Now, it requires a certain quantity of pure

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* *Klaproth's Beiträge*, i. 260.

† *Jour. de Min.* N° xxxvii. p. 1.

carbon to decompoſe a given weight of nitre. From the experiments of Lavoiſier, it follows, that when the detonation is performed in cloſe veſſels under water, 13.21 parts of charcoal are capable of decompoſing 100 parts of nitre.* But when the detonation is performed in an open crucible, a ſmaller proportion of charcoal is neceſſary, becauſe part of the nitre is decompoſed by the action of the ſurrounding air. Scheele found, that under theſe circumſtances 10 parts of plumbago were ſufficient to decompoſe 96 parts of nitre, and Mr Kirwan found, that nearly the ſame quantity of charcoal was ſufficient for producing the ſame effect.

Macquer long ago obſerved, that no volatile oily matter will detonate with nitre, unleſs it be previouſly reduced to a charcoal; and that then its effect upon nitre is preciſely proportional to the charcoal which it contains †. Mr Kirwan, upon trying the experiment with *vegetable pitch* and *maltha*, found, that theſe ſubſtances did not detonate with nitre, but merely burn upon its ſurface with a white or yellow flame; and that after they were conſumed, nearly the ſame quantity of charcoal was neceſſary to decompoſe the nitre which would have been required if no bitumen had been uſed at all ‡. Now coals are chiefly compoſed of charcoal and bitumen. It occurred therefore to Mr Kirwan, that the quantity of charcoal which any coal contains may be aſcertained by detonating it with nitre: For ſince the bitumen of the coal has no effect in decompoſing nitre, it is evident that the detonation and decompoſition muſt be owing to the charcoal of the coal; and that therefore the quantity of coal neceſſary to decompoſe a given portion of nitre will indicate the quantity of carbon which it contains: and the proportion of charcoal and earth which any coal contains being aſcertained, its bituminous part may be eaſily had from calculation.

The crucible which he uſed in his experiments was large; it was placed in a wind furnace at a diſtance from the flue, and the heat in every experiment was as equal as poſſible. The moment the nitre was red hot, the coal, previouſly reduced to ſmall pieces of the ſize of a pin head, was projected in portions of one or two grains at a time, till the nitre would no longer detonate; and every experiment was repeated ſeveral times to enſure accuracy.

He found, that 480 grains of nitre required 50 grains of Kilkenny coal to decompoſe it by this method. Therefore 10 grains would have decompoſed 96 of nitre; preciſely the quantity of charcoal which would have produced the ſame effect. Therefore Kilkenny coal is compoſed almoſt entirely of charcoal.

Cannel coal, when incinerated left a reſiduum of 3.12 in the 100 parts of earthy aſhes. 66.5 grains of it were required to decompoſe 480 grains of nitre; but 50 parts of charcoal would have been ſufficient: therefore 66.5 grains of cannel coal contain 50 grains of charcoal, and 2.08 of earth; the remaining 14.42 grains muſt be bitumen. In this manner may the compoſition of any other coal be aſcertained.

320
Method of analyſing ſulphur.

As for ſulphur, in order to aſcertain any accidental impurities with which it may be contaminated, it ought to be boiled in thirty times its weight of water, afterwards in diluted muriatic acid, and laſtly in diluted nitro-muriatic acid. Theſe ſubſtances will deprive it of all its impurities without acting on the ſulphur itſelf, at leaſt if the proper cautions be attended to. The ſulphur may then be dried and weighed. The deficiency in weight will mark the quantity of the ſubſtances which contaminate the ſulphur. The ſolutions may be evaporated and examined, according to the rules laid down in the ſecond and fourth ſections of this chapter.

Sect. IV. *Of the analyſis of Ores.*

321
No general method of analyſing ores.

The method of analyſing ores muſt vary conſiderably, according to the metals which they are ſuſpected to contain. A general method, therefore, of analyſing would be of no uſe, even if it could be given, becauſe it would be too complicated ever to be practiſed. We ſhall content ourſelves with exhibiting a ſufficient number of the analyſes of ores, to take in moſt of the caſes which can occur. He who wiſhes for more information on the ſubject, may conſult the treatiſe of Bergman on the *Analyſes of ores;* Mr Kirwan's treatiſe on the ſame ſubject; and, above all, he ought to ſtudy the numerous analyſes of ores which have been publiſhed by Mr Klaproth.

I. Analyſes of Red Silver Ore.

322
Method of analyſing red ſilver ore.

Mr Vauquelin analyſed this ore as follows:

He reduced 100 parts of it to fine powder, poured over it 500 parts of nitric acid previouſly diluted with water, and applied a gentle heat to the mixture. The colour of the powder, which before the mixture with nitric acid was a deep purple, became gradually lighter, till at laſt it was pure white. During this change no nitrous gas was extricated; hence he concluded, that the metals in the ore were in the ſtate of oxyds.

When the nitric acid, even though boiled gently, did not appear to be capable of diſſolving any more of the powder, it was decanted off, and the reſiduum, after being carefully waſhed, weighed 42.06.

Upon theſe 42.06 parts concentrated muriatic acid was poured; and by the application of heat, a conſiderable portion was diſſolved. The reſiduum was repeatedly waſhed with muriatic acid, and then dried. Its weight was 14.6666. One portion of theſe 14.6666 parts, when thrown upon burning coals, burnt with a blue flame and ſulphureous ſmell. Another portion ſublimed in a cloſe veſſel without leaving any reſiduum. In ſhort, they had all the properties of ſulphur. Therefore 100 parts of red ſilver ore contain 14.6666 of ſulphur.

The muriatic acid ſolution was now diluted with a great quantity of water; it became milky, and depoſited a white flaky powder, which when waſhed and dried weighed 21.25. This powder, when heated with tartar in a crucible, was converted into a bluiſh white brittle metal, of a foliated texture, and poſſeſſing all the other properties of antimony. Red ſilver ore therefore contains 21.25 of oxyd of antimony.

The ſolution in nitric acid remained now to be examined. When muriatic acid was poured into it, a copious white precipitate appeared, which, when waſhed and dried, weighed 72.66. It had all the properties of muriat of ſilver. According to Mr Kirwan's tables, 72.66 of muriat of ſilver contain 60.57 of oxyd of ſilver, Therefore red ſilver ore, according to this analyſis, is compoſed of

compoſed of	60.57	oxyd of ſilver,
	21.25	oxyd of antimony,
	14.66	ſulphur.
	96.48	

The

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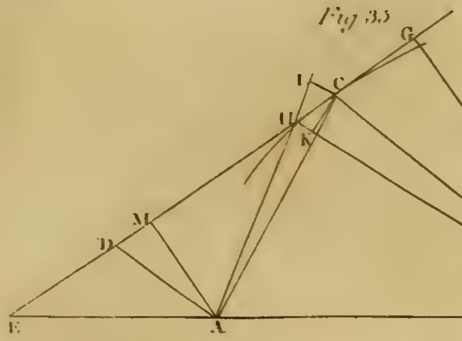
* Mem. Sçav. Etrang. xi. 626.

† Macquer's Dictionary, 2d edit. p. 481.

‡ Mineralogy, ii. 522.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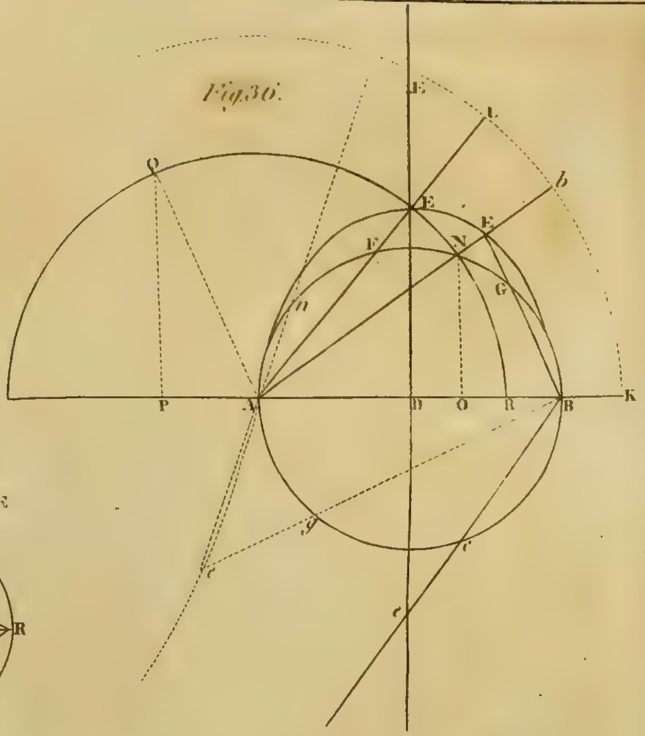
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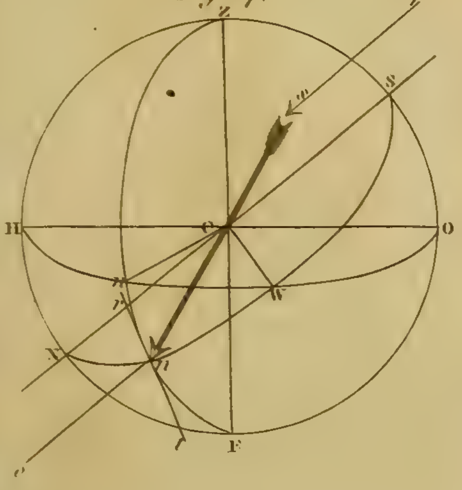
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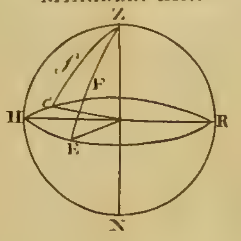

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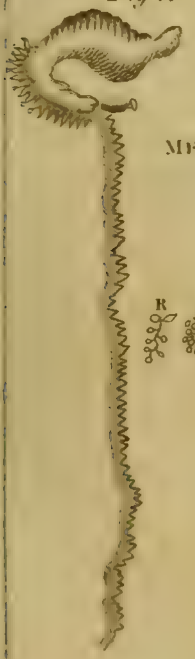
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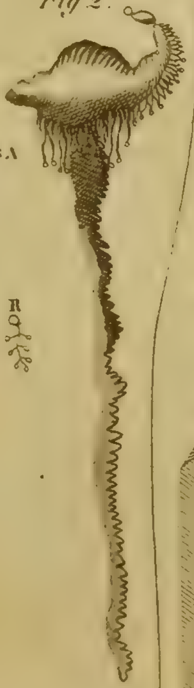
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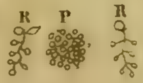
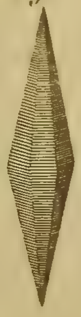


MINERALOGY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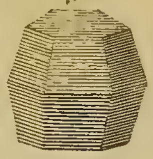
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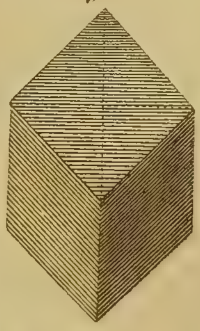
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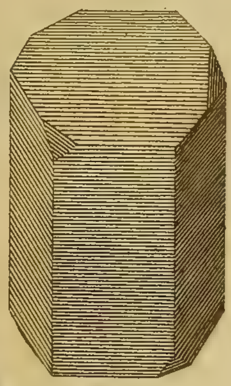
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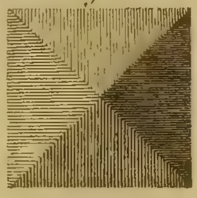
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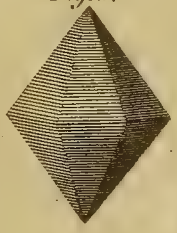
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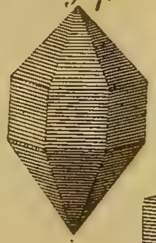
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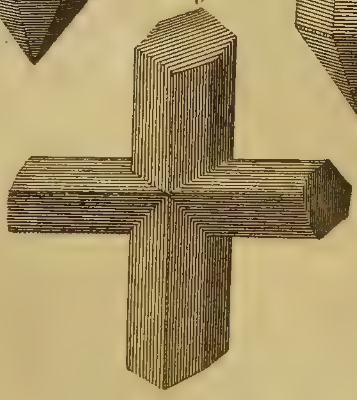
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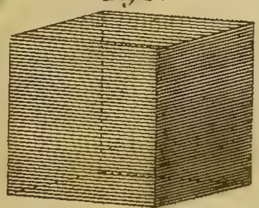
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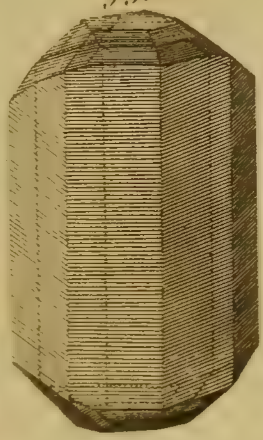
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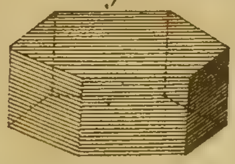
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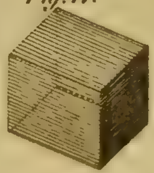
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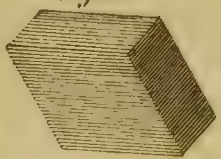
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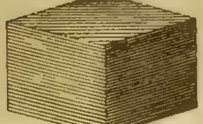
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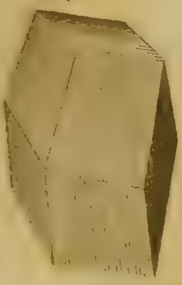
Lawson sc.

MINERALOGY PLATE XXXVII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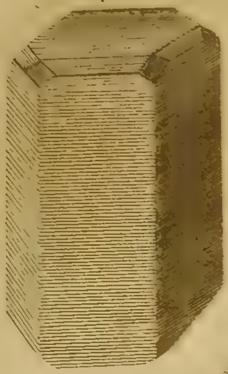
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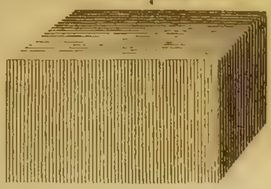
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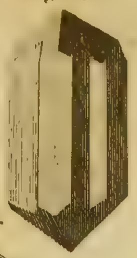
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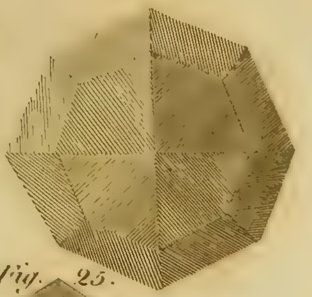
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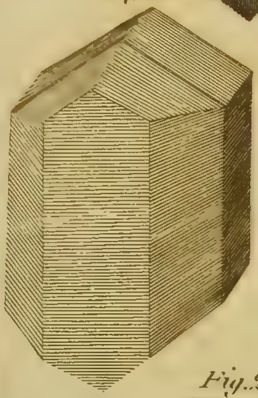
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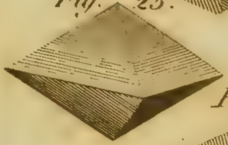
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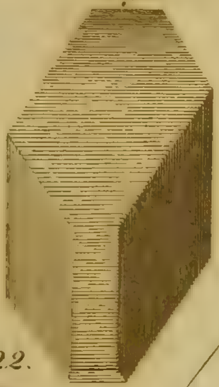
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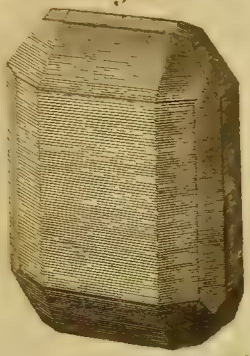
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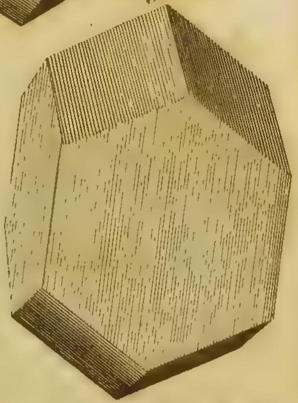
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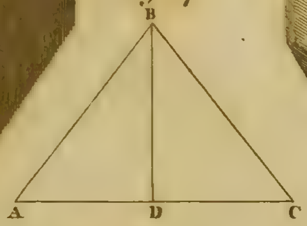
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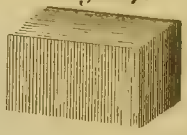
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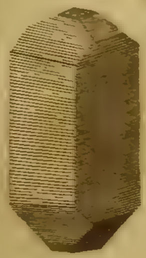
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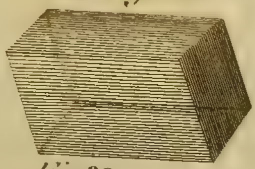
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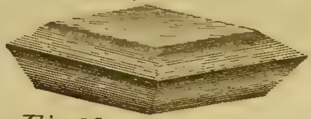
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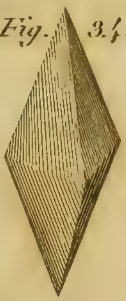
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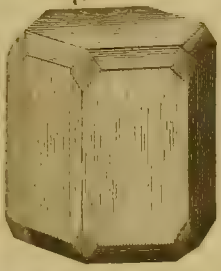
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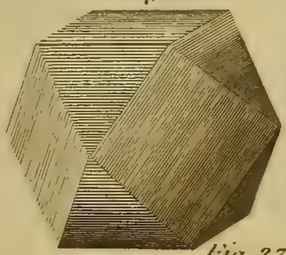
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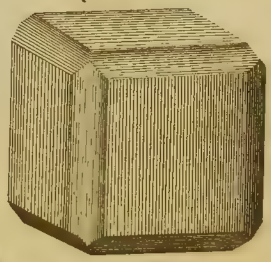
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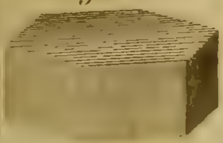
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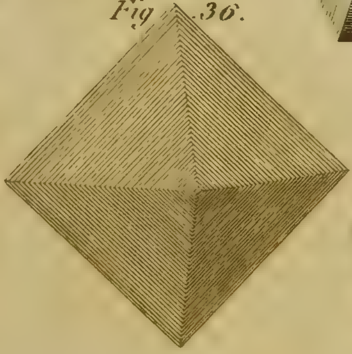
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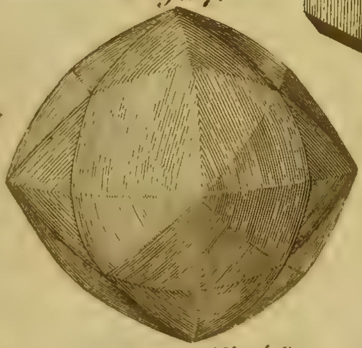
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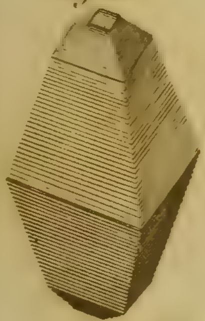
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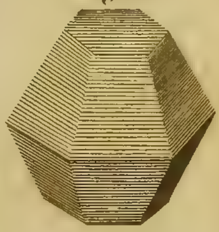
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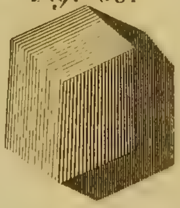
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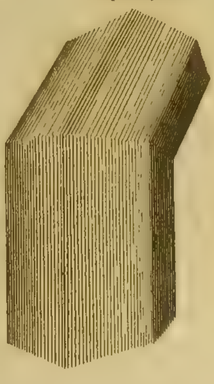
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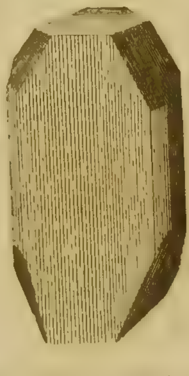
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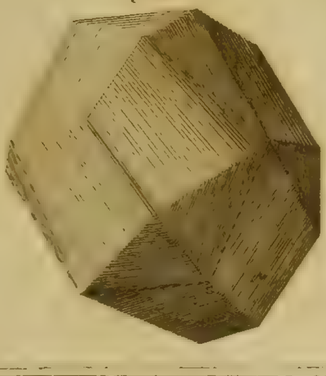
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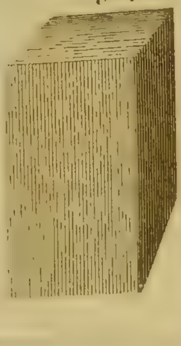
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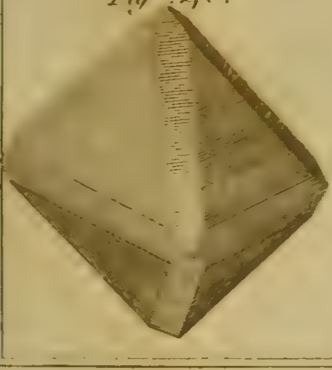
Fig. 40.

The loſs, which amounts to 3.52 parts, is to be aſcribed to unavoidable errors which attend ſuch experiments.

II. Antimoniated Silver Ore.

323 Analyſis of antimoniated ſilver ore.

Klaproth analyſed this ore as follows:

On 100 parts of the ore, reduced to a fine powder, he poured diluted nitric acid, raiſed the mixture to a boiling heat, and after pouring off the acid, added new quantities repeatedly, till it would diſſolve nothing more. The reſiduum was of a greyiſh yellow colour, and weighed, when dry, 26.

Theſe 26 parts he digeſted in a mixture of nitric and muriatic acid; part was diſſolved and part ſtill remained in the form of a powder. This reſiduum, when waſhed and dried, weighed 13 parts. It had the properties of ſulphur; and when burnt, left a reſiduum of one part, which had the properties of ſilica. Antimoniated ſilver ore, therefore, contains, in the 100 parts, 12 parts of ſulphur and 1 of ſilica.

When the nitro-muriatic ſolution was diluted with about 20 times its weight of water, a white precipitate appeared; which, when heated to redneſs, became yellow. Its weight was 13. No part evaporated at a red heat: therefore it contained no arſenic. On burning coals, eſpecially when ſoda was added, part was reduced to a metal, having the properties of antimony; and in a pretty high heat, the whole evaporated in a grey ſmoke. Theſe 13 parts were therefore oxyd of antimony: They contain about 10 parts of metallic antimony; and as the ſtate of oxyd was produced by the action of the nitric acid, we may conclude, that antimoniated ſilver ore contains 10 parts of antimony.

The nitric acid ſolution remained ſtill to be examined. It was of a green colour. When a ſolution of common ſalt was poured in, a white precipitate was obtained, which poſſeſſed the properties of muriat of ſilver. When dried, it weighed 87.75 parts; and when reduced, 65.81 parts of pure ſilver were obtained from it. Antimoniated ſilver ore, therefore, contains 65.81 of ſilver.

Into the nitric acid ſolution, thus deprived of the ſilver, he dropped a little of the ſolution of ſulphat of ſoda; but no precipitate appeared. Therefore it contained no lead.

He ſuperſaturated it with pure ammonia, on which a grey precipitate appeared. When dried, it weighed 5 parts. This, on burning coals, gave out an arſenical ſmell. It was rediſſolved in nitric acid; ſulphurated alkali occaſioned a ſmutty brown precipitate; and pruſſic alkali a pruſſian blue, which, after torrefaction, was magnetic. Hence he conclude, that theſe 5 parts were a combination of iron and arſenic acid.

The nitric ſolution, which had been ſuperſaturated with ammonia, was blue; he therefore ſuſpected that it contained copper. To diſcover this, he ſaturated it with ſulphuric acid, and put into it a poliſhed plate of iron. The quantity of copper was ſo ſmall, that none could be collected on the iron.

III. Grey Copper Ore.

324 Analyſis of grey copper ore.

Klaproth analyſed this ore as follows:

Three hundred grains of it, not completely freed from its matrix, were reduced to a fine powder; four times their weight of nitric acid was poured on them, and the whole was digeſted. The acid was then poured off, and an equal quantity again digeſted on the reſiduum. The two acid ſolutions were mixed together. The reſiduum was of a yellowiſh grey colour, and weighed 188 grains.

On this reſiduum ſix times its weight of muriatic acid was boiled. The reſiduum was waſhed, firſt with muriatic acid, and afterwards with alcohol, and the waſhings added to the muriatic acid ſolution. The reſiduum, when dried, weighed 105.5 grains. Part of it burned with a blue flame; and was therefore ſulphur. The reſiduum amounted to 80.25 grains, and had the properties of ſilica. When melted with black flux, about $\frac{3}{4}$ths of a grain of ſilver were obtained from it. Thus 300 parts of grey copper ore contain 25.25 gr. of ſulphur, and 79.5 of ſilica.

The muriatic acid ſolution, which was of a light yellow colour, was concentrated by diſtillation, a few cryſtals of muriat of ſilver appeared in it, which contained about $\frac{1}{4}$th grain of ſilver. The ſolution, thus concentrated, was diluted with a great quantity of water; a white precipitate was depoſited, which, when dried, weighed 97.25 grains. It poſſeſſed the properties of oxyd of antimony, and contained 75 grains of antimony. Therefore 300 grains of grey copper ore contain 70 of antimony.

The nitric acid ſolution was of a clear green colour. A ſolution of common ſalt occaſioned a white precipitate, which was muriat of ſilver, and from which 31.5 grains of ſilver were obtained.

A little ſulphat of potaſs, and afterwards ſulphuric acid, were added, to ſee whether the ſolution contained lead; but no precipitate appeared.

The ſolution was then ſuperſaturated with ammonia; a looſe flaky browniſh red precipitate appeared, which, when heated to redneſs, became browniſh black, and weighed 9$\frac{1}{4}$th grains. This precipitate was diſſolved in muriatic acid; half a grain of matter remained undiſſolved, which was ſilica. The muriatic acid ſolution, when pruſſic alkali was added, afforded a blue precipitate; and ſoda afterwards precipitated 1.5 grains of alumina. Therefore 300 grains of grey copper ore contain 7.25 grains of iron, and 1.5 of alumina.

Into the nitric ſolution ſuperſaturated with ammonia, and which was of an azure blue colour, a poliſhed plate of iron was put: By this method 69 grains of copper were obtained.

IV. Sulphuret of Tin.

325 Analyſis of ſulphuret of tin.

Klaproth analyſed this ore as follows:*

On 120 grains of the ore reduced to powder, ſix times their weight of nitro-muriatic acid, compoſed of 2 parts of muriatic, and 1 of nitric acid, were poured. There remained undiſſolved 43 grains, which had the appearance of ſulphur; but containing green ſpots, was ſuſpected not to be pure. After a gentle combuſtion, 13 grains remained; 8 of which were diſſolved in nitro-muriatic acid, and added to the firſt ſolution. The remaining 5 were ſeparated by the filtre, and heated along with wax. By this method about a grain of matter was obtained, which was attracted by the magnet; and which therefore was iron. The reſiduum weighed 3 grains, and was a mixture of alumina and ſilica. Thus 120 grains of ſulphuret of tin contain 30 grains of ſulphur, 1 of iron, and 3 of alumina and ſilica.

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* *Obſervations on the Foſſils of Cornwall*, p. 48.

The nitro-muriatic ſolution was completely precipitated by potaſs. The precipitate was of a greyiſh green colour. It was waſhed and dried, and again diſſolved in diluted muriatic acid. Into the ſolution a cylinder of pure tin was put, which weighed exactly 217 grains. The ſolution became gradually colourleſs, and a quantity of copper precipitated on the cylinder of tin, which weighed 44 grains. To ſee whether it was pure, a quantity of nitric acid was digeſted on it; the whole was diſſolved, except one grain of tin. Therefore 120 grains of ſulphuret of tin contains 43 grains of copper.

The cylinder of tin now weighed only 128 grains; ſo that 89 grains had been diſſolved. Into the ſolution a cylinder of zinc was put; upon which a quantity of tin precipitated. When waſhed and dried, it weighed 130 grains. The tin he melted with tallow and powdered charcoal; and when cold, he waſhed off the charcoal. Among the tin globules were found ſome black flocculi of iron, which weighed one grain. Deducting this grain, and the 89 grains of the tin cylinder which had been diſſolved, we ſee that the 120 grains of ſulphuret of tin contained 40 grains of tin beſides the grain which had been detected in the copper.

326
Analyſis of plumbiferous antimoniated ſilver ore.

V. Plumbiferous Antimoniated Silver Ore.

Klaproth analyſed this ore as follows:

He digeſted 400 grains of it, reduced to a fine powder, firſt in five times its weight of nitric acid, and then in twice its weight of the ſame acid. He then diluted this laſt portion of acid with eight times its weight of water, and continued the digeſtion. The undiſſolved reſiduum, when waſhed and dried, weighed 326 grains.

On this reſiduum he boiled muriatic acid repeatedly. The ſolution, on cooling, depoſited acicular cryſtals. Theſe he carefully ſeparated, and put by. The undiſſolved reſiduum weighed 51 grains. It had the properties of ſulphur. When burned, it left one grain of ſilica.

The muriatic acid ſolution was concentrated to half its former bulk by diſtillation: this made it depoſite more acicular cryſtals. He continued the diſtillation as long as any cryſtals continued to appear. He then collected the whole of theſe cryſtals together. They had the properties of muriat of lead. When mixed with twice their weight of black flux, and heated in a crucible lined with charcoal, they yielded 160½ grains of lead.

Sulphuret of ammonia was now added to the muriatic acid ſolution; an orange-coloured precipitate appeared, which ſhewed that the ſolution contained antimony. It was precipitated by a copious effuſion of water, and by ſoda. The oxyd of antimony being reduced to a maſs with Spaniſh ſoap, mixed with black flux, and heated in a lined crucible, yielded 28.5 grains of antimony.

Into the nitric acid ſolution, obtained by the firſt part of the proceſs, a ſolution of muriat of ſoda was dropped; a white precipitate was depoſited, and over it acicular cryſtals. Theſe cryſtals he diſſolved, by pouring boiling water on the precipitate. The water was added to the nitric acid ſolution. The white precipitate was muriat of ſilver: when heated with twice its weight of ſoda, it yielded 81.5 grains of ſilver.

He now concentrated the nitric acid ſolution by evaporation; and then adding a ſolution of ſulphat of ſoda, a white precipitate was obtained, which had the properties of ſulphat of lead, and weighed 43 grains. It contained 32 grains of pure lead.

He now poured ammonia into the ſolution; a pale brown precipitate was obtained, which weighed 40 grains, and which appeared to conſiſt of oxyd of iron and alumina. He rediſſolved it in nitric acid, precipitated the iron by pruſſic alkali, and the alumina by ſoda. The alumina after being heated to redneſs, weighed 28 grains; conſequently the oxyd of iron was 12 grains, which is equivalent to 9 grains of iron.

VI. Molybdat of Lead.

Mr Hatchett analyſed this ore as follows†:

327
Analyſis of molybdat of lead.

On 250 grains of the ore, reduced to a fine powder, he poured an ounce of ſtrong ſulphuric acid, and digeſted the mixture in a ſtrong heat for an hour. When the ſolution was cool, and had ſettled, he decanted it off, and waſhed the undiſſolved powder with pure water, till it came away taſteleſs. This operation was repeated twice more; ſo that three ounces of ſulphuric acid were uſed. All theſe ſolutions were mixed together, and filtered.

Four ounces of a ſolution of carbonat of ſoda were poured upon the powder which remained undiſſolved, and which conſiſted of ſulphat of lead. The mixture was boiled for an hour, and then poured off. The powder was then waſhed, and diluted nitric acid poured on it: The whole was diſſolved, except a little white powder, which, when waſhed, and dried on a filter by the heat of boiling water, weighed ſeven-tenths of a grain. It poſſeſſed the properties of ſilica.

The nitric acid ſolution was ſaturated with pure ſoda; a white precipitate was obtained, which, when waſhed, and dried for an hour in a heat rather below redneſs, weighed 146 grains. It poſſeſſed the properties of oxyd of lead.

To ſee whether this oxyd of lead contained any iron, it was diſſolved in diluted nitric acid, and the lead precipitated by ſulphuric acid. The ſolution was then ſaturated with ammonia; a brown powder precipitated, which, when dried, weighed one grain, and had the properties of oxyd of iron.

The ſulphuric acid ſolution was of a pale blue colour: It was diluted with 16 times its weight of pure water, and then ſaturated with ammonia. It became of a deep blue colour, and appeared turbid. In 24 hours a pale yellow precipitate ſubſided, which, when collected on a filter, and dried by a boiling water heat, weighed 4.2 grains. Its colour was yellowiſh brown. Muriatic acid diſſolved it, and pruſſiat of potaſs precipitated it from its ſolution in the ſtate of pruſſian blue. It was therefore oxyd of iron.

The ſulphuric acid ſolution, ſaturated with ammonia, was gradually evaporated to a dry ſalt. This ſalt was a mixture of molybdat of ammonia and ſulphat of ammonia. A ſtrong heat was applied, and the diſtillation continued till the whole of the ſulphat of ammonia was driven off; and to be certain that this was the caſe, the fire was raiſed till the retort became red hot. The reſiduum in the retort was a black bliſtered maſs; three ounces of nitric acid, diluted with water, were poured upon it, and diſtilled off. The operation was again repeated.

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† *Phil. Tranſ.* lxxxvi. 310.

peated. By this method the oxyd of molybdenum was converted into a yellow powder, which was yellow acid of molybdenum. It weighed 95 grains.

VII. Grey Ore of Manganeſe.

Mr Vauquelin analyſed this ore as follows ‡.

328 Analyſis of grey ore of mangaueſe. When 200 grains of it were expoſed to a ſtrong heat in a retort, there came over 10 grains of water, and 18 cubic inches of oxygen gas, mixed with a little carbonic acid gas. The mineral now weighed only 176 grains. Therefore the weight of the gas was 14 grains.

On 200 grains of the ſame mineral muriatic acid was poured, and heat applied. 75 cubic inches of oxy-muriatic acid gas came over, which, though mixed with ſome carbonic acid gas, enflamed metals when reduced to powder. When no more gas came over, the reſiduum was boiled. The whole was diſſolved, except a white powder, which weighed 12 grains, and which poſſeſſed the properties of ſilica.

Carbonat of potaſs was poured into the ſolution; a white precipitate was obtained, which became black by expoſure to the air, and weighed 288 grains. Strong nitric acid was boiled on it repeatedly to dryneſs. It became of a deep black colour, and, when well waſhed with water and dried, weighed 164 grains. This powder was black oxyd of manganeſe.

To ſee whether it contained iron, nitric acid, with a little ſugar, was poured upon it, and digeſted on it. The acid diſſolved it completely. Therefore no oxyd of iron was preſent.

Into the water with which the black oxyd of manganeſe had been waſhed, carbonat of potaſs was poured; a white powder precipitated, which, when dried, weighed 149 grains, and which poſſeſſed the properties of carbonat of lime.

VIII. Wolfram.

329 Analyſis of wolfram. Meſſrs Vauquelin and Hecht analyſed this mineral as follows:

On 200 parts of wolfram in powder, three times its weight of muriatic acid were poured, and the mixture boiled for a quarter of an hour: a yellow powder appeared, and the ſolution was of a brown colour. The acid was allowed to cool, and then carefully decanted off, and the reſiduum waſhed. The reſiduum was then digeſted for ſome hours with ammonia, which diſſolved a part of it. The reſiduum was waſhed, and new muriatic acid again poured over it; then the reſiduum was digeſted with ammonia, as before: and the operation was continued till the whole wolfram was diſſolved.

All the ammoniacal ſolutions being joined together, were evaporated to dryneſs, and the ſalt which remained was calcined: a yellow powder was obtained: it weighed 134 grains, and was yellow acid of tungſten.

Into the muriatic acid ſolutions, which were all mixed together, a ſufficient quantity of ſulphuric acid was poured to decompoſe all the ſalts. The ſolution was then evaporated to dryneſs; and the ſalts which were obtained by this evaporation were rediſſolved in water. A white powder remained, which weighed three grains, and which poſſeſſed the properties of ſilica.

The exceſs of acid of the ſolution was ſaturated with carbonat of potaſs; the liquor became brown, but nothing precipitated. When boiled, a red powder precipitated, and the brown colour diſappeared. The addition of more carbonat of potaſs cauſed a farther precipitation of a yellowiſh powder. This precipitate conſiſted of the oxyds of iron and manganeſe combined. Nitric acid was diſtilled off it repeatedly; it was then boiled in acetous acid. The acetous ſolution was precipitated by potaſs. Nitric acid was again diſtilled off it, and it was again boiled in acetous acid. This proceſs was repeated till nitric acid produced no further change. The different powders which could not be diſſolved in the acetous acid were collected, mixed with a little oil, and heated red hot. The powder became black, and was attracted by the magnet. It was therefore oxyd of iron. It weighed 36 grains.

The acetous ſolution contained the oxyd of manganeſe: It was precipitated by an alkali, and, when dried, weighed 12.5 grains.

IX. Oxyd of Titanium and Iron.

330 Analyſis of oxyd of titanium and iron. Vauquelin analyſed this ore as follows:

A hundred parts of the ore, reduced to a fine powder, and mixed with 400 parts of potaſs, were melted in a ſilver crucible for an hour and a half. When cool, the mixture was diluted with water; a powder remained of a brick red colour, which, when waſhed and dried, weighed 124 parts.

The watery ſolution had a fine green colour; when an exceſs of muriatic acid was added, it became red. By evaporation the liquor loſt its colour. When evaporated to dryneſs, a ſalt remained, which was totally diſſolved by water. From this ſolution carbonat of potaſs precipitated two parts, which had the properties of oxyd of manganeſe.

The 124 parts of reſiduum were boiled in a ſolution of pure potaſs for an hour. The ſolution was ſaturated with an acid, filtered, and carbonat of potaſs added, which precipitated three parts. Theſe had the properties of oxyd of titanium.

The remainder of the 124 parts of reſiduum, which ſtill was undiſſolved, was boiled with diluted muriatic acid. The liquor became yellow, and depoſited 46 parts of a white powder, with a tint of red. This powder was ſoluble in ſulphuric and muriatic acids: from theſe ſolutions, it was precipitated of a brick red colour by the infuſion of nut galls; of a green colour by ſulphuret of ammonia and pruſſiat of potaſs; and of a white colour by carbonat of potaſs and pure ammonia. A rod of tin made theſe ſolutions red; a rod of zinc made them violet. Theſe 46 parts, therefore, are oxyd of titanium.

The muriatic ſolution, from which theſe 46 parts were depoſited, formed, with pruſſiat of potaſs, a pruſſian blue; and ammonia precipitated from it 50 parts, which had the properties of yellow oxyd of iron.

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‡ Jour. de Min. N° xvii p. 12.

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Mingun, Miquelon.

MINGUN *Iſlands*, on the N. ſide of the mouth of the river St Lawrence. They have the iſland Anticoſti S. diſtant 10 leagues. N. lat. 50° 15′, W. long. 63° 25′.—*Morse.*

MINGO-TOWN, an Indian town on the W. bank of the Ohio river, 86 miles N. E. of Will's-Town, by the Indian Path, and 40 ſouth-weſterly of Pittſburg. It ſtands a few miles up a ſmall creek, where there are ſprings that yield the *petrol*, a bituminous liquid.—*ib.*

MINGOES, an Indian nation who inhabit near the ſouthern branch of the Sciota river. Warriors, 50.—*ib.*

MINISINK, a village in New-Jerſey, on the N. W. corner of the State, and on the weſtern ſide of Delaware river; about 5 miles below Montague, and 57 N. W. of Brunſwick.—*ib.*

MINISINK, a townſhip in Orange county, New-York, bounded eaſterly by the Wallkill, and ſoutherly by the State of New-Jerſey. It contains 2,215 inhabitants; of whom 320 are entitled to be electors, and 51 are ſlaves.—*ib.*

MIQUELON, a ſmall deſert iſland, 8 miles S. W. of Cape May in Newfoundland iſland. It is the moſt weſterly of what have been called the 3 iſlands of St Pierre or St Peter, and is not ſo high as the other two; but its ſoil is very indifferent, and it is not more than three-fourths of a league in length. There is a paſſage or channel from the weſtward along by the N. end of this iſland into Fortune Bay on the S. coaſt of Newfoundland. N. lat. 47° 4′, W. long. 55° 55′. It is ſometimes called *Maguelon.*—*ib.*

Mirabeau.

MIRABEAU (Honnoré Gabriel, Comte de), well known both by his writings, and the active part which he took in bringing about the French revolution, was born in 1749 of a noble family. Throughout life, he diſplayed a ſpirit averſe from every reſtraint, and was one of thoſe unhappy geniuſes in whom the moſt brilliant talents ſerve only as a ſcourge to themſelves and all around them. It is told by his demooratical panegyriſts, as a wonderful proof of family tyranny under the old government, that not leſs than 67 *lettres de cachet* had been obtained by Mirabeau the father againſt this ſon and others of his relatives. This ſtory, if true, proves, with at leaſt equal force, what many anecdotes confirm, that, for his ſhare of them, the ſon was not leſs indebted to his own ungovernable diſpoſition than to the ſeverity of his parent. He was indeed a monſter of wickedneſs. Debauchery, gaming, impiety, and every kind of ſenſuality, were not enough for him. He was deſtitute of decency in his vices; and to ſupply his expences, ſcrupled not to perform tricks which would diſgrace a thief-catcher. His father and mother diſagreeing, commenced a proceſs of ſeparation; when Mirabeau, juſt liberated from priſon for a groſs miſdemeanor, was in want of money. He went to his father, ſided with him againſt his mother, on whom he poured a torrent of invectives; and, for 100 guineas, wrote his father's memorial for the court. He then went to his mother; and by a ſimilar conduct got the ſame ſum from her; and both memorials were preſented. That the father of ſuch a man ſhould frequently get him ſhut up in priſon, can excite no ſurpriſe; for confinement only could withhold him from the perpetration of crimes.

The talents of Mirabeau led him frequently to employ his pen; and his publications form the chief epochas of his life. His firſt publication was, 1. *Eſſai ſur le Deſpotiſme*, "An Eſſay on Deſpotiſm," in 8vo. Next, in one of his confinements, he wrote, 2. a work in 2 vols 8vo, *On Lettres de Cachet*. 3. *Conſiderations ſur l'Ordre de Cincinnatus*, 8vo. A remonſtrance againſt the order of Cincinnatus, propoſed at one time to be eſtabliſhed in America. The public opinion in America favoured this remonſtrance, and it proved effectual. 4. His next work was in favour of the Dutch, when Joſeph II. demanded the opening of the Scheldt, in behalf of the Brabançons. It is entitled, *Doutes ſur la Liberté de l'Eſcant*, 8vo. 5. *Lettre à l'Empereur Joſeph II. ſur ſon Réglement concernant l'Emigration*; a pamphlet of forty pages, in 8vo. 6. *De la Caiſſe d'Eſcompte*; a volume in 8vo, written againſt that eſtabliſhment. 7. *De la Banque d'Eſpagne*, 8vo; a remonſtrance againſt eſtabliſhing a French bank in Spain. A controverſy ariſing upon this ſubject, he wrote again upon it. 8. Two pamphlets on the monopoly of the water company in Paris.

Soon after the publication of theſe works, he was ſent in a public character to the court of Berlin; where he conducted the king's affairs juſt as he had formerly done thoſe of his father and mother, fully ready to ſacrifice all parties, and to ſell himſelf to the higheſt bidder. With ſuch a diſpoſition, he could not long avoid the notice of the Pruſſian illuminees; and Nicolai Bieſter, Gedicke, and Leuchſenring, ſoon became his conſtant companions. At Brunſwick he met with Mauvillon, the worthy diſciple of Philo Knigge, and at that time a profeſſor in the Caroline college. This was the man who initiated the profligate Marquis in the laſt myſteries of illuminiſm.

Mirabeau was ſtill at Berlin when Frederick II. died. That monarch, as is well known, was a naturaliſt, who holding this life for his all, encouraged the propagation of infidelity in his dominions, from which reſulted the very worſt conſequences to the peace of ſociety. Of this truth his ſucceſſor Frederick William was duly ſenſible; and determined to ſupport the church eſtabliſhment in the moſt peremptory manner, conſiſtent with the principles of religious toleration. He publiſhed, therefore, ſoon after his acceſſion, an edict on religion, which is a model worthy of imitation in every country; but it was attacked with the greateſt virulence in numberleſs publications. It was called an unjuſtifiable tyranny over the conſciences of men; the dogmas ſupported by it were termed abſurd ſuperſtitions; the king's private character and his religious opinions were ridiculed and ſcandalouſly abuſed. The moſt daring of theſe attacks was a collection of anonymous letters on the conſtitution of the Pruſſian ſtates, univerſally believed to be the compoſition of Mirabeau, who certainly wrote a French tranſlation, with a preface and notes more impudent than the work itſelf. The monarch is declared to be a tyrant; the people of the Pruſſian dominions are addreſſed as a parcel of tame wretches, crouching under oppreſſion; and the inhabitants of Sileſia, repreſented as ſtill in a worſe condition, are repeatedly called upon to rouſe themſelves, and aſſert their rights.

About this time he publiſhed, 9. An *Eſſai ſur le Secte des Illuminés*; one of the ſtrangeſt and moſt impudent books that ever appeared. In it he deſcribes a ſect exiſting in Germany, called the *Illuminated*; and ſays, that they are the moſt abſurd and groſs fanatics imaginable, waging war with every appearance of reaſon, and maintaining the moſt *ridiculous ſuperſtitions*. He gives ſome account of theſe, and of their rituals and ceremonies, as if he had ſeen them all; yet no ſuch ſociety as he deſcribes ever exiſted: and Mirabeau employed his powers of deception, merely to ſcreen from obſervation the real *illuminati*, by holding out to the rulers of ſtates this *ignis fatuus* of his own brain. For a while the eſſay certainly contributed to blind the eyes of the German princes; and Nicolai, with others of the junto, adopting the whim, called Mirabeau's fanatics *Obſcuranten*, and joined with him in placing on the liſt of *Obſcuranten* ſeveral perſons whom they wiſhed to make ridiculous.

Long before his initiation in the myſteries of illuminiſm, Mirabeau had been acquainted with all the revolutionary powers of the maſonic lodges; nor did he when initiated, undervalue thoſe which flowed, or might flow, from Weiſhaupt's inventive genius. On his return to France, he began to introduce the new myſteries among ſome of his maſonic brethren. His firſt aſſociate was the Abbé Talleyrand de Perigord, who had already begun to act the part of Judas in the firſt order of the church. But to have only introduced the myſteries was not ſufficient for the Marquis; he would have teachers come from Germany, who were better verſed than he was in the illuminizing arts. Well acquainted with the reaſons that had induced the chiefs of the order to defer the converſion of France, he found means to convince them, that the time was now come for the accompliſhment of their views; and at his requeſt a deputation was ſent by Spartacus to illuminize that great kingdom. See ILLUMINATI, n° 40, 41, *Suppl.*

When the aſſembly of Notables was convened at Paris, Mirabeau foretold that it would ſoon be followed by a meeting of the States; and at that period he publiſhed a volume againſt the ſtockjobbing, then carried to a great height, intitled, 10. *Denonciation de l'agiotage au Roi, et a l'Aſſemblée de Notables*, 8vo. A *lettre de cachet* was iſſued againſt him in conſequence of this publication; but he eluded purſuit, and publiſhed a pamphlet as a ſequel to the book. His next work was againſt M. Necker, 11. *Lettre á M. de Cretelle, ſur l'Adminiſtration de M. Necker*, a pamphlet in 8vo. 12. A volume, in 8vo. againſt the Stadtholderſhip: *Aux Bataves, ſur le Stadthouderat*. 13. *Obſervations ſur la maiſon de force appellé Bicetre*, an 8vo pamphlet. 14.

Another tract, intitled, *Conſeils à un jeune Prince qui ſent la néceſſité de refaire ſon education.* 15. He now proceeded to a larger and more arduous work than any he had yet publiſhed, on the Pruſſian monarchy under Frederick the Great: *De la Monarchie Pruſſienne ſous Fréderic le Grand.* 4 vols, 4to, or eight in 8vo. In this work, he undertakes to define preciſely how a monarchy ſhould be conſtituted. When the orders were iſſued for convening the States general, Mirabeau returned into Provence: and at the ſame time publiſhed, 16. *Hiſtoire Secrette de la Cour de Berlin,* two volumes of letters on the Secret Hiſtory of the Court of Berlin. This work was condemned by the parliament of Paris, for the unreſerved manner in which it delivered the characters of many foreign princes. As the elections proceeded, he offered himſelf a candidate in his own order at Aix; but he was ſo abhorred by the nobleſſe, that they not only rejected him, but even drove him from their preſence. This affront ſettled his meaſures, and he determined on their ruin. He went to the commons, diſclaimed his being a gentleman, ſet up a little ſhop in the market-place of Aix, where he ſold trifles; and now, fully reſolved what line he ſhould purſue, he courted the commons, by joining in all their exceſſes againſt the nobleſſe, and was at laſt returned a member of the aſſembly.

In conſequence of this, he went to Paris; where the part he took was active, and ſuch as tended, in general, to accelerate all the violences of the revolution. He now publiſhed, periodically, 17. his *Lettres à ſes Commettans,* Letters to his Conſtituents, which form, when collected, 5 vols, 8vo. It is ſuppoſed, that the fatal meaſure of the junction of the three orders into one national aſſembly, was greatly promoted by theſe letters. The public events of theſe times, and the part taken in them by Mirabeau, are the ſubject of general hiſtory. He lived to ſee the conſtitution of 1789 eſtabliſhed, but not to ſee its conſequences—the deſtruction of the monarchy, the death of the king, and the ruin of all property! He was accuſed, as well as the duke of Orleans, of hiring the mob which attacked Verſailles on the 5th and 6th of October 1789; but with him was alſo acquitted by the tribunal of the Châtelet. The dominion of his eloquence in the National Aſſembly had long been abſolute, and on the 29th of January 1791, he was elected preſident. At the latter end of March, in the ſame year, he was ſeized by a fever, and died on the 2d of April.

The talents of Mirabeau will not be doubted, though they were certainly rather brilliant than profound. To be noticed, and to lead, were the ſole objects of his ambition; and for the attainment of them, he took the ſide of the diſcontented, as the beſt field for his matchleſs eloquence. Yet there was no man more devoted to the principles of a court than this Marquis, provided he could have a ſhare in the adminiſtration; and a ſhare he would have obtained, if any thing moderate would have ſatisfied him: But he thought nothing worthy of him but a place of active truſt, and a high department; ſtations which all knew him not qualified to fill. Wanting knowledge of great things, he was learned only in the buſtling detail of intrigue, and would, at any time, have ſacrificed his deareſt friend, and the intereſts of his country, for an opportunity of exerciſing his brilliant eloquence, and indulging his propenſity to ſatire and lampoon. But the greateſt obſtacle to his advancement under the old government was the abject worthleſſneſs of his character. Drinking was the only vice in which he did not indulge; and from this he was reſtrained by his exhauſted conſtitution. To his brother, the Viſcount, who was frequently intoxicated, the Marquis one day ſaid, "How can you, brother, ſo expoſe yourſelf?" "What (replied the Viſcount)! how inſatiable are you? Nature has given you every vice; and having left me only this one, you grudge it me!"

MIRAGOANE, a town on the N. ſide of the ſouth peninſula of the iſland of St Domingo, and S. ſide of the Bight of Leogane, at the head of a bay of its name. It is on the road from Jeremie to Port au Prince, about 31 leagues E. by S. of the former, and 23 W. by S. of the latter. N. lat. 18° 27'.—*Morſe.*

MIRAMICHI, or *Mirachi,* a port, bay and river on the N. E. coaſt of New-Brunſwick. The port is at the mouth of the river. The entrance into the bay is very wide; it has Point Portage for its northern entrance, and its ſouthern ſide is formed by Eſcuminax point, which is 53 miles N. E. of Shediac harbour, and 34 S. E. of the mouth of Nipiſighit river, which empties into Chaleur bay. There is a ſalmon fiſhery in Miramichi river.—*ib.*

MIRAY *Bay,* on the coaſt of the iſland of Cape Breton, is to the S. from Morienne Bay. Large veſſels may go up 6 leagues, and have good anchorage, and lie ſecure from all winds. N. lat. 46° 5', W. long. 59° 49'.—*ib.*

MIREBALAIS, an interior town in the French part of the iſland of St Domingo, ſituated nearly 12 leagues N. of Port au Prince, on the road from that city to Varettes; from which laſt it is 14 leagues ſouth-eaſt.—*ib.*

MISCOTHINS, a ſmall tribe of Indians who inhabit between Lake Michigan and the Miſſiſſippi.—*ib.*

MISERY, an iſle between Salem and Cape Ann in Maſſachuſetts.—*ib.*

MISKO, an iſland on the ſouth-weſt ſide of Chaleur Bay, at its mouth.—*ib.*

MISSINABE *Lake* is ſituated in the north part of North-America, in lat. 48° 29' 42" N. and long. 84° 2' 42" W.—*ib.*

MISSINABE *Houſe* is ſituated on the eaſt ſide of Mooſe river, 8 miles from Miſſinabe lake, and 80 W. by S. of Frederick Houſe; and is a ſtation belonging to the Hudſon Bay Company.—*ib.*

MISSIQUASH *River.* Nova-Scotia and New-Brunſwick provinces are ſeparated by the ſeveral windings of this river, from its confluence with Beau Baſin (at the head of Chignecto channel) to its riſe or main ſource; and from thence by a due eaſt line to the bay of Verte, in the ſtraits of Northumberland.—*ib.*

MISSISSIPPI *River.* This noble river, which, with its eaſtern branches, waters five eighths of the United States, forms their weſtern boundary, and ſeparates them from the Spaniſh Province of Louiſiana and the Indian country. Its ſources have never been explored; of courſe its length is unknown. It is conjectured, however, to be upwards of 3,000 miles long. The tributary ſtreams which fall into it from the weſt and eaſt, are numerous, the largeſt of which are the Miſſouri from the weſt, and the Illinois, Ohio, and Tenneſſee from the eaſt. The country on both ſides of the

Miſſiſſippi, and on its tributary ſtreams, is equal in goodneſs to any in N. America. This river is navigable to St Anthony's Falls without any obſtruction, and ſome travellers deſcribe it as navigable above them. On both ſides of this river are ſalt ſprings or licks, which produce excellent ſalt; and on its branches are innumerable ſuch ſprings. Beſides the coal mines in the upper parts of the Ohio country, there are great quantities of coal on the upper branches of this river. An iſland of conſiderable ſize is formed by its mouths, beſides many ſmaller iſles. Theſe mouths are ſituated between the latitude of 29° and 30° N. and between the longitude of 89° and 90° W.—*ib.*

MISSOURI *River*, in Louiſiana, falls into the Miſſiſſippi from the weſtward, 18 miles below the mouth of the Illinois, 195 above the mouth of the Ohio, and about 1160 miles from the Balize, or mouths of the Miſſiſſippi in the gulf of Mexico. We have not ſufficient knowledge of this river to give any correct account of the extent of its navigation. In Capt. Hutchins's map, it is ſaid to be navigable 1300 miles.—*ib.*

MISSOURIS, one of the Indian nations who inhabit the banks of the above river, having, it is ſaid, 1500 warriors.—*ib.*

MISTAKE *Bay*, a large bay on the weſt ſide of the entrance of Davis's Straits, and to the north of Hudſon's Straits; from which it is ſeparated by a peninſula of the north main on the W. and Reſolution Iſland on the ſouth. It is to the N. E. of Nieva Iſland, and N. W. of Cape Elizabeth.—*ib.*

MISTAKEN *Cape*, the ſouth point of the eaſternmoſt of the Hermit's Iſlands, is about 3 leagues E. N. E. from Cape Horn, at the extremity of S. America. Between theſe, it is ſuppoſed, there is a paſſage into Naſſau Bay.—*ib.*

Mistaken *Point*, to the weſtward of Cape Race, at the S. E. point of the Iſland of Newfoundland, and to the eaſtward of Cape Pine, is ſo called becauſe it has been frequently miſtaken by ſeamen for Cape Race when they firſt make the iſland from the ſouthward, though it is 2 leagues W. N. W. from it.—*ib.*

MISTIC, or *Myſtic*, a ſhort river which falls into the north ſide of Boſton harbour, by a broad mouth on the eaſt ſide of the peninſula of Charleſtown. It is navigable for ſloops 4 miles to the induſtrious town of Medford; and is croſſed, a mile above its mouth, by a bridge 130 rods in length, through which veſſels paſs by means of a draw.—*ib.*

MISTINSINS, an Indian nation who inhabit on the ſouthern ſide of the lake of the ſame name in Lower Canada.—*ib.*

MISTISSINNY *Lake*, in Canada, on the S. E. ſide of which is a Canadian Houſe, or ſtation for trade. —*ib.*

MISTRAL, the name of a wind, which is mentioned in almoſt every account that we have of Provence, and which is remarkable for blowing almoſt the whole year from north-weſt or weſt-north-weſt, in a climate where the wind ſhould be variable. It is ſaid to contribute to the ſalubrity of the air, by diſperſing the exhalations of the marſhes and ſtagnant waters, ſo common in the ſouth of Languedoc and Provence; but at times it is alſo very injurious, or at leaſt very troubleſome. It is not, however, on either of theſe accounts that it is introduced into this Work, but for the ſake of the cauſes aſſigned by Sauſſure for its conſtancy, which may be applied to other winds that nearly reſemble it; and which he found might be reduced to three.

"The firſt and moſt effectual cauſe (he ſays) is the ſituation of the Gulf of Lyons, the banks of which are the principal theatre of its ravages. This Gulf, in fact, is ſituated at the bottom of a funnel, formed by the Alps and Pyrenees. All the winds blowing from any point between weſt and north, are forced by theſe mountains to unite in the Gulf. Thus, winds which would not have prevailed but at one extremity of the Gulf, or even much beyond it, are obliged to take this route, after having undergone the repercuſſion of theſe mountains; and the middle of the Gulf, inſtead of the calm which it might have enjoyed, is expoſed to the united efforts of two ſtreams of wind, deſcending in different directions. Hence ariſe thoſe whirlwinds which ſeem to characteriſe the miſtral, and appear to have induced the ancients to call it *Circius, à turbine ejus ac vertigine*. See *Aul. Gellius*, l. ii. cap. 22.

"The ſecond cauſe is, the general ſlope of the grounds, deſcending from all ſides towards the Gulf; which becoming all at once lower and more ſoutherly than the lands extending behind it, is, from theſe joint circumſtances, rendered the hotteſt point of all the adjacent country: and, as the air on the ſurface of the earth always tends from the colder to the warmer regions, the Gulf of Lyons is actually the centre towards which the air from all colder points between eaſt and weſt muſt preſs. This cauſe, then, alone would be productive of winds directed to the Gulf, even if the repercuſſion of the mountains did not exert its influence.

"Finally, it is well known, that in all gulfs the land-winds blow more forcibly than oppoſite to plains and promontories, whatever be the ſituation of thoſe gulfs. I apprehend, indeed, on ſtrict examination (ſays our author), that this cauſe is blended with the preceding; but as the fact is generally admitted, and in ſome caſes can be explained only by reaſons drawn from the effects of heat, it may not improperly, perhaps, be diſtinctly mentioned. It is, at leaſt, neceſſary to ſuppoſe, that ſeveral cauſes produce the miſtral, in order to underſtand why, notwithſtanding the variableneſs of the ſeaſons and temperatures, that wind is ſo ſingularly conſtant in Lower Languedoc and Lower Provence. A very remarkable inſtance of this conſtancy is recorded by the Abbé Papon, in his *Voyage de Provence*, tom. ii. p. 81. He aſſerts, that during the years 1769 and 1770, the miſtral continued for fourteen months ſucceſſively. But the three cauſes which I have ſtated, taken ſeparately, will explain its frequency, and united, will account for its force."

MITCHELL'S *Eddy*, the firſt falls of Merrimack river, 20 miles from its mouth, and 8 above the new bridge which connects Haverhill with Bradford. Thus far it is navigable for ſhips of burden.—*Morſe.*

MITCHIGAMAS, an Indian nation, who with the Piorias inhabit near the ſettlements in the Illinois country.—*ib.*

MIXT Angle, or *Figure*, is one contained by both right and curved lines.

Mixt Number, is one that is partly an integer and partly a fraction; as $3\frac{1}{2}$.

Mixt Ratio, or *Proportion*, is when the ſum of the antecedent and conſequent is compared with the difference of the antecedent and conſequent;

$$\text{as if}\begin{cases}4:3::12:9\\ a:b::c:d\end{cases}$$

$$\text{then}\begin{cases}7:1::21:3\\ a+b:a-b::c+d:c-d.\end{cases}$$

MOAGES *Iſlands*, on the N. coaſt of S. America, in the entrance of the Gulf of Venezuela. They extend from N. to S. and lie weſt of the Iſland of Aruba; are 8 or 9 in number, and all, except one, low, flat and full of trees. The ſouthernmoſt is the largeſt. —*Morse.*

MOBILE, a large navigable river, formed by two main branches the Alabama, and Tombigbee, in the ſouth-weſtern part of Georgia, juſt below a conſiderable iſland, the ſouth point of which is in about lat. 31° 26′ N. and long. 87° 55′ W. Thence purſuing a ſouth courſe into Weſt-Florida, the confluent ſtream enters the Gulf of Mexico, at Mobile Point in lat. 30° 17′ N. 11 leagues below the town of Mobile. Large veſſels cannot go within 7 miles of the town. The breadth of the bay is in general about 3 or 4 leagues. Vaſt numbers of large alligators baſk on the ſhores, as well as ſwim in the rivers and lagoons. From the north-eaſtern ſource of the waters of the Alabama to Mobile Point, at the mouth of Mobile Bay, is, according to the beſt maps, about 460 miles: large boats can navigate 350 miles, and canoes much farther.—*ib.*

Mobile, a city of Weſt-Florida, formerly of conſiderable ſplendor and importance, but now in a ſtate of decline. It is pretty regular, of an oblong figure, and ſituated on the W. bank of the river. The Bay of Mobile terminates a little to the north-eaſtward of the town, in a number of marſhes and lagoons; which ſubject the people to fevers and agues in the hot ſeaſon. It is 33 miles north of Mobile point, about 40 below the junction of the two principal branches of Mobile river, and 30 W. N. W. of Penſacola. There are many very elegant houſes here, inhabited by French, Engliſh, Scotch, and Iriſh. Fort Conde, which ſtands very near the bay, towards the lower end of the town, is a regular fortreſs of brick; and there is a neat ſquare of barracks for the officers and ſoldiers. Mobile, when in poſſeſſion of the Britiſh, ſent yearly to London ſkins and furs to the value of from 12 to £15,000 ſterling. It ſurrendered to the Spaniſh forces in 1780.—*ib.*

MOBJACK *Bay*, ſets up N. W. from Cheſapeak Bay, into Glouceſter county, Virginia, on the north ſide of York river.—*ib.*

MOCASSIMAH, in Bengal, revenue ſettled by a diviſion of the produce.

MOCHULKAH, bond or obligation.

MOCOA, a city of Terra Firma, S. America, ſituated at the main ſource of Oronoko river, there called Inirchia.—*Morse.*

MOCOMOKO, or *Little Oronoko*, a river to the S. E. of the great river Oronoko, on the eaſt coaſt of S. America, 4 leagues weſtward of Amacum.—*ib.*

MODER and *Daughters Iſlands*, a long iſland 2 leagues eaſt by ſouth of the Father, or Vaader Iſland, with 2 ſmall ones, ſo called, near Cayenne, on the eaſt coaſt of S. America, not far from the Conſtables, and in about lat. 5° N. long. 52° W.—*ib.*

MŒRIS, a lake in Egypt, occaſionally mentioned in that article *(Encycl.)*, and generally ſuppoſed the production of human art. Of this, however, Mr Brown ſays it bears no mark. "The ſhape, as far as was diſtinguiſhable, ſeems, not inaccurately laid down in D'Anville's map, unleſs it be, that the end neareſt the Nile ſhould run more in a north-weſt and ſouth-eaſt direction. The length may probably be between 30 and 40 miles; the breadth, at the wideſt part he could gain, was 5000 toiſes, as taken with a ſextant; that is, nearly ſix miles. The utmoſt poſſible extent of circuit muſt of courſe be 30 leagues. On the north-eaſt and ſouth is a rocky ridge, in every appearance primeval. In ſhort, nothing can preſent an appearance more unlike the works of men. Several fiſhermen, in miſerable boats, are conſtantly employed on the lake. The water is brackiſh, like moſt bodies of water under the ſame circumſtances. It is, in the language of the country, *Birket-el-kerun*, probably from its extremities bearing ſome reſemblance to horns.

MOFUSSEL, a relative term, ſignifying the ſubordinate lands or diſtricts, oppoſed to Sudder, which is the head.

MOGHULBUGHKITUM, or *Muhulbucktitum*, a creek which runs weſtward to Alleghany river, in Pennſylvania. It is paſſable in flat-bottomed boats to the ſettlements in Northumberland county. Wheeling is its northern branch.—*Morse.*

MOHACZ, Mohatz, or *Mohoz*, a town in the Lower Hungary, upon the Danube, between the river Sarwiza to the north, and the Drave to the ſouth; four German miles from either, ſix from Eſſeck to the north, and nine from Colocoa to the ſouth. This otherwiſe ſmall place is memorable for two great battles here fought; the firſt between Lewis king of Hungary and Solyman the Magnificent, in 1526: in which that unfortunate Prince Lewis (being about 20 years old), with 25,000 men, fought 300,000 Turks; when, being overpowered by numbers, 22,000 of the Chriſtian army were ſlain upon the place; 5000 waggons, eighty great cannon, 600 ſmall ones, with all their tents and baggage, were taken by the victors; and the King, in his flight over the brook Curaſs, fell into a quagmire, and was ſwallowed up. After which, Solyman took and ſlew 200,000 Hungarians, and got ſuch a footing in that kingdom, that he could never be expelled. This fatal battle was fought October 29. The ſecond, in ſome part, retrieves the loſs and infamy of the former. The Duke of Loraine being ſent by the Emperor, with expreſs orders to paſs the Drave and take Eſſeck, his highneſs, July 10, 1687, with great difficulty paſſed that river, then extremely ſwelled with rains; but finding the Prime Viſier encamped at Eſſeck, with an army of 100,000 men, ſo ſtrongly, that it was not poſſible to attack him in that poſt without the ruin of the Chriſtian army, he retreated, and repaſſed it the 23d of the ſame month; where, upon the 29th, the Prime Viſier paſſed that river at Eſſeck; and upon Auguſt 12th, there followed a bloody fight, in which the Turks loſt 100 pieces of cannon, 12 mortars, all their ammunition, proviſions, tents, baggage, and treaſure, and about 8000 men upon the place of battle, beſides what were drowned ed in paſſing the river, which could never be known. After which victory, General Dunewalt, September 30th, found Eſſeck totally deſerted by the Turks, and took poſſeſſion of it.

MOHAWK *River*, in New-York, riſes to the northward of Fort Stanwix, about 8 miles from Black, or Sable river, a water of Lake Ontario, and runs ſouthwardly 20 miles to the fort, then eaſtward 110 miles, and after receiving many tributary ſtreams, falls into Hudſon river, by three mouths oppoſite to the cities of Lanſinburgh and Troy, from 7 to 10 miles N. of Albany. The produce that is conveyed down this river, is landed at Schenectady, on its S. bank, and is thence conveyed by land 16 miles, over a barren, ſandy, ſhrub plain to Albany. It is in contemplation either to cut a canal from Schenectady to the navigable waters of Hudſon river, or to eſtabliſh a turnpike road between Schenectady and Albany. This fine river is now navigable for boats, from Schenectady, nearly or quite to its ſource, the locks and canals round the Little Falls, 56 miles above Albany, having been completed in the Autumn of 1795; ſo that boats full loaded now paſs them. The canal round them is nearly ¼ of a mile, cut almoſt the whole diſtance through an uncommonly hard rock. The opening of this navigation is of great advantage to the commerce of the State. A ſhore of at leaſt 1000 miles in length, is, in conſequence of it, waſhed by boatable waters, excluſive of all the great lakes, and many millions of acres of excellent tillage land, rapidly ſettling, are accommodated with water communication for conveying their produce to market. The intervales on both ſides of this river, are of various width, and now and then interrupted by the projection of the hills quite to the banks of the river, are ſome of the richeſt and beſt lands in the world. The fine farms which embrace theſe intervales, are owned and cultivated principally by Dutch people, whoſe mode of managing them would admit of great improvement. The manure of their barns they conſider as a nuiſance, and inſtead of ſpreading it on their upland, which they think of little value, (their meadow lands do not require it) they either let it remain for years in heaps, and remove their barns, when acceſs to them becomes difficult, or elſe throw it into the river, or the gullies and ſtreams which communicate with it. The banks of this river were formerly thickly ſettled with Indians. At the period when Albany was firſt ſettled, it has been ſaid by reſpectable authority, that there were 800 warriors in Schenectady; and that 300 warriors lived within a ſpace which is now occupied as one farm. The Cohoez in this river are a great curioſity. They are 3 miles from its entrance into the Hudſon. The river is about 1000 feet wide; the rock over which it pours, as over a mill-dam, extends from S. W. to N. E. almoſt in a line from one ſide of the river to the other, and is about 40 feet perpendicular height, and including the deſcent above, the fall is as much as 60 or 70 feet. About a mile below the falls, is a handſome bridge, finiſhed in July, 1795. It is 1100 feet in length, 24 in breadth, and 15 feet above the bed of the river, which for the moſt part is rock, and is ſupported by thirteen ſolid ſtone pillars. It is a free bridge, and including the expence of cutting through a ledge on the N. E. ſide of the river, coſt 12,000 dollars. The river immediately below the bridge, divides into three branches, which form ſeveral large iſlands. The branches are fordable at low water, but are dangerous. From the bridge you have a fine view of the Cohoez on the N. W.—*Morſe*.

MOHAWK, a branch of Delaware river. Its courſe from its ſource in Lake Uttayantha is S. W. 45 miles, thence S. E. 12 miles, when it mingles with the Popachton branch; thence the confluent ſtream is called Delaware.—*ib.*

MOHAWKS, an Indian nation, acknowledged by the other tribes of the Six Nations to be "the true old heads of the confederacy." They were formerly very powerful, and inhabited on Mohawk river. As they were ſtrongly attached to the Johnſon family, on account of Sir William Johnſon, a part of them emigrated to Canada with Sir John Johnſon, as early as the year 1776. About 300 of this nation now reſide in Upper Canada.—*ib.*

MOHEGAN, ſituated between Norwich and New-London, in Connecticut. This is the reſidence of the remains of the Mohegan tribe of Indians. A conſiderable part of the remains of this tribe lately removed to Oneida with the late Mr Occom.—*ib.*

MOHER, in Bengal, a gold coin, worth about 33 ſhillings.

MOHERIR, a writer of accounts.

MOHICCONS, a tribe of Indians who inhabit on a branch of the Suſquehannah, between Chagnet and Owegy. They were reckoned by Hutchins, about 30 years ago, at 100, but by Imlay, in 1773, at only 70 fighting men. They were formerly a confederate tribe of the Delawares. Alſo an Indian tribe, in the N. W. Territory, who inhabit near Sanduſky, and between the Sciota and Muſkingum; warriors, 60.—*Morſe.*

MOINEAU, a flat baſtion raiſed before a curtin when it is too long, and the baſtions of the angles too remote to be able to defend one another. Sometimes the moineau is joined to the curtin, and ſometimes it is divided from it by a moat. Here muſquetry are placed to fire each way.

MOINS, a river of Louiſiana, which empties from the N. W. into the Miſſiſſippi, in lat. 40 20 N. The Sioux Indians deſcend by this river.—*Morſe.*

MOISIE *River*, on the N. ſhore of the St Lawrence, is about 3 leagues W. S. W. of Little Saguena river, from which to the W. N. W. within the Seven Iſlands, is a bay ſo called from theſe iſlands.—*ib.*

MOLE (See TALPA, *Encycl.*), is an animal exceedingly troubleſome, both to gardeners and farmers; and there are perſons who contrive to make a livelihood by the trade of *mole-catching*. Theſe men, it is well known, are generally quacks and cheats; and the ſecrets which they ſell for extirpating thoſe deſtructive animals are of very little avail. Even poiſon ſeldom produces any conſiderable effect; becauſe the mole, while it does not drink, lives only on roots and worms. Under the word MOLE (*Encycl.*), ſome directions will be found for clearing fields of this deſtructive animal; but the following are perhaps preferable, as they ſeem to have been the reſult of much experience;

Immediately at day-break, it will be neceſſary to make a tour round the garden or meadow, from which it is wiſhed to extirpate the moles; for at that time they will be all found at work, as may be ſeen by the hills newly thrown up. If the perſon is then cloſe to the hill, he muſt proceed as the gardeners do, and turn up with a ſtroke of the ſpade the hill together with the digger. The paſſage is then cut through before the animal is aware of the attack; and therefore it has not power to eſcape. If the mole-hill be freſh, even though the animal may not be throwing up earth, the perſon ought not to loſe his time in waiting, but ſhould immediately proceed to the operation above-mentioned.

If you find a freſh hill ſtanding by itſelf, which ſeems to ſhew by its ſituation that it has no communication with any other, which is always the caſe when the mole has worked from the ſurface downwards in endeavouring to procure a more convenient habitation, after the hill has been turned up with the ſpade, a bucket of water ſhould be poured over the mouth of the paſſage. By theſe means the animal, which is at no great diſtance, will be obliged to come forth, and may be eaſily caught with the hand.

You may diſcover alſo whether a hill has any communication with another, if you apply your ear to it, and then cough or make a loud noiſe. If it has no communication with the neighbouring hills, you will hear the terrified animal make a noiſe by its motion. It will then be impoſſible for it to eſcape; and you may either pour water into the hole, or turn up the hill with a ſpade, until the mole is found; for, in general, it never goes deeper into the earth than from fifteen to eighteen inches.

When any of the beds in a garden have been newly watered, the mole, attracted by the coolneſs and moiſture, readily repairs thither, and takes up its reſidence in them, making a paſſage at the depth of ſcarcely an inch below the ſurface. In that caſe it may eaſily be caught. When you ſee it at work, you need only tread behind the animal with your feet on the paſſage to prevent its retreat, and then turn up the hill with a ſpade; by which means you will be ſure to catch it.

When you dig after it with a ſpade, the animal forces its way downwards into the earth in a perpendicular direction, in order that it may the better eſcape the threatened danger. In that caſe it will not be neceſſary to dig long, but to pour water over the place, which will ſoon make the animal return upwards.

People, in general, are not aware of the great miſchief occaſioned in fields and gardens by theſe animals. We are, however, informed by Buffon, that in the year 1740 he planted fifteen or ſixteen acres of land with acorns, and that the greater part of them were in a little time carried away by the moles to their ſubterranean retreats. In many of theſe there were found half a buſhel, and in others a buſhel. Buffon, after this circumſtance, cauſed a great number of iron traps to be conſtructed; by which, in leſs than three weeks, he caught 1300. To this inſtance of the devaſtation occaſioned by theſe animals, we may add the following: In the year 1742 they were ſo numerous in ſome parts of Holland, that one farmer alone caught between five and ſix thouſand of them. The deſtruction occaſioned by theſe animals is, however, no new phenomenon. We are informed by hiſtory, that the inhabitants of the iſland of Tenedos, the Trojans, and the Æolians, were infeſted by them in the earlieſt ages. For this reaſon a temple was erected to Apollo Smynthius, the deſtroyer of moles. See *Economiſche Heſte*, Vol. VII. Part 5. and Vol. IX. Part 4.; or *Phil. Magazine*, N° 5.

MOLE, *The*, is ſituated in the N. W. part of the iſland of St Domingo, 2 leagues E. of Cape St Nicholas, and is often called by that name. The Mole, though inferior, by a great deal, to Cape Francois and Port au Prince, is the firſt port in the iſland for ſafety in time of war, being ſtrongly fortified both by nature and art. Count D'Eſtaing, under whoſe direction theſe works were conſtructed, intended to have eſtabliſhed here the ſeat of the French government; but the productions of its dependencies were of too little value to engage his ſucceſſors to carry his plan into effect; ſo that it is now no more than a garriſon. It has a beautiful and ſafe port, and is conſidered as the healthieſt ſituation in St Domingo, by reaſon of the purity of its ſprings. The exports from Jan. 1, 1789 to December 31, of the ſame year, were only 265,615lb. coffee—26,861lb. cotton—2,823lb. indigo, and other ſmall articles to the value of 129 livres. The value of duties on exportation 1,250 dollars 21 cents. It is 4 leagues W. of Jean Rabel, 11 N. W. of Bombarde, 36 W. of Cape Francois, and 17½ W. by S. of Port de Paix. N. lat. 19 50, W. long. 75 48.—*Morse.*

MOLINE's *Gut*, on the S. W. ſide of the iſland of St Chriſtopher's in the W. Indies, is the firſt rivulet to the S. E. of Brimſtone Hill, near the mouth of which is anchorage in 5 and 10 fathoms, and a clear ſhore; but to the eaſtward of it are ſome ſunken rocks.—*ib.*

MOMENTS, in the new doctrine of infinites, denote the indefinitely ſmall parts of quantity; or they are the ſame with what are otherwiſe called infiniteſimals and differences, or increments and decrements; being the momentary increments or decrements of quantity conſidered as in a continual flux.

Moments are the generative principles of magnitude; they have no determined magnitude of their own, but are only inceptive of magnitude.

Hence, as it is the ſame thing if, inſtead of theſe moments, the velocities of their increaſes and decreaſes be made uſe of, or the finite quantities that are proportional to ſuch velocities; the method of proceeding which conſiders the motions, changes, or fluxions of quantities, is denominated by Sir Iſaac Newton, the *method of fluxions*.

Leibnitz, and moſt foreigners, conſidering theſe infinitely ſmall parts, or infiniteſimals, as the differences of two quantities, and thence endeavouring to find the differences of quantities, *i. e.* ſome moments, or quantities indefinitely ſmall, which taken an infinite number of times ſhall equal given quantities, call theſe moments differences; and the method of procedure, the differential calculus.

MONA, or *La Guenon*, or *The Mone*, a ſmall iſland, 11¼ leagues S. W. of Point l'Epee, which is the ſouth-weſternmoſt point of the iſland of St Domingo, and 14½ leagues W. of the S. W. point of the iſland of Porto Rico. It is 2 leagues from E. to W. and a little more from N. to S. It has ſeveral ports for ſmall veſſels, plenty of good water, and all that would be neceſſary for ſettlements of culture, and the breeding of cattle. Its fruit trees, and particularly the orange, are much extolled. A league and a half N. W. of Mona is a very ſmall iſland, called Monique, or the Little Monkey.—*Morse.*

MONADNOCK, *Great*, a mountain ſituated in Cheſhire county, New-Hampſhire, between the towns of

Jaffray and Dublin, 10 miles N. of the Maſſachuſetts line, and 22 miles E. of Connecticut river. The foot of the hill is 1395 feet, and its ſummit 3254 feet, above the level of the ſea. Its baſe is 5 miles in diameter, from N. to S. and 3 from E. to W. On the ſides are ſome appearances of ſubterraneous fires. Its ſummit is a bald rock.—*ib.*

MONADNOCK, *Upper Great*, a high mountain, in Canaan, in the N. E. corner of the State of Vermont.—*ib.*

MONAHAN, a townſhip in York county, Pennſylvania.—*ib.*

MONDAY *Bay*, on the S. ſhore of the ſtraits of Magellan, in that part of the ſtraits called the Long Beach, and 4 leagues W. of Piſſpot Bay. It is nearly S. of Buckley Point, on the N. ſide of the ſtrait, and affords good anchorage in 20 fathoms.—*ib.*

MONDAY, a cape in the above Straits, 7 leagues W. N. W. of Cape North. S. lat. 53 12, W. long. 75 20. —*ib.*

MONGEARTS, one of the tribes of wandering Arabs which inhabit the SAHARA, or Great Deſert of Africa. Their time is wholly occupied by tending their cattle; and becauſe they are little ſkilled in the uſe of arms, *Mongeart* is a term of contempt among the people by whom they are ſurrounded. Their country, with its produce, will be deſcribed under the title SAHARA in this *Supplement;* it is the buſineſs of this article merely to exhibit the manners of the people.

They are all Mahometans, and offer up prayers three times a day, ſometimes oftener; but having no moſques, theſe prayers are never pronounced in public, except when the horde is viſited by a prieſt, who ſeldom comes but upon account of the children's education. Then all the Arabs aſſemble at the hour of prayer, place themſelves in a line, turn to the eaſt, and, wanting water in the deſert, rub their face and arms with ſand; while the prieſt recites aloud the general prayer. It is the ſame as that which is rehearſed by the public crier in the moſques in civilized countries.

The prieſts are employed in travelling about the country to inſtruct the children. There is nothing like force in their education. The little boys meet in the morning of their own accord, at the place of inſtruction, which is to them a place of recreation. They go there with a ſmall board inſcribed with the Arabic characters, and a few maxims of the Koran. The oldeſt, and the beſt informed, receive their leſſons directly from the prieſts, and afterwards communicate them to their fellows. They are never corrected; becauſe it would be a crime to beat a child, who, according to the received notions, has not ſufficient reaſon to diſtinguiſh good from evil. This lenity extends even to the children of Chriſtians, though in a ſtate of ſlavery. They are treated in all reſpects like the children of Arabs; and the man who ſhould be raſh enough to ſtrike one of them, would endanger his life. Very different is their treatment of Negro children; who may indeed join in all the amuſements of the young Arabs, and even attend the public ſchools; but if they be guilty of a fault, they are ſeverely puniſhed.

When the child of a Mongeart becomes tired of the places of public inſtruction, he quits them at pleaſure, and, without feeling conſtraint, or hearing reproach, goes and employs himſelf in tending his father's flocks: and accordingly there are very few among them who can read. Thoſe who perſevere in the ſtudy of the Koran are made prieſts, after having paſt an examination before the learned elders, and enjoy the greateſt public conſideration. They have no need of cattle; for thoſe of the nation being theirs, they find their ſubſiſtence everywhere.

It is generally at ſeven or eight years of age that children undergo the painful operation of circumciſion. Their head is alſo ſhaved, nothing being left but four locks of hair; one of which is cut off in a meeting of the family, at each remarkable action performed by the child. If, at the age of 12 or 13, he kill a wild boar, or other beaſt of prey, that ſhould fall upon his flock, he loſes one of his locks. If, in the paſſage of a river, a camel be carried away by the ſtream, and he ſave it by ſwimming to its aſſiſtance, another is cut off. If he kill a lion, a tiger, or a warrior of an hoſtile nation, in a ſurpriſe or an attack, he is conſidered as a man, and his head is entirely ſhaved.

Different from the other Arabs their neighbours, and indeed from the Mahometans in general, the Mongearts trouble no man on account of his religion. The only one which they do not tolerate is the Jewiſh; and were a Jew to enter their territory, and have the miſfortune to be taken, he would certainly be burnt alive.

According to M. Saugnier, the women are much more reſpected among the Mongearts than among the neighbouring nations; but the evidences which he gives of that reſpect are very extraordinary.

When a Mongeart is deſirous of undertaking the care of a family, he pitches upon the girl that pleaſes him the moſt, and aſks her of her father without further formality; nor can the latter refuſe her, unleſs the man who pretends to her hand have done ſomething contrary to the laws of the nation. The girl is conducted by her parents to the tent of her future huſband, where there is always an abundant repaſt prepared for the ceremony. Preſents are made to the father; but if the ſon-in law be poor, his wife's family aſſiſt him, and furniſh him with the means of increaſing his flocks; if, on the contrary, he be rich, and the father poor, he ſupports the whole family in his own tent. The employment of the wife, thus married, is to prepare the food; to ſpin the goats and camels hair, of which the tents are made; to milk the cattle; to pick up the neceſſary ſupply of wood for the night; and when the hour of repaſt is come, to wait upon her huſband. She then eats by herſelf what has been left by him and his male ſlaves. She is, indeed, in no great danger of having a rival brought into the family; for though polygamy be allowed by his religion, the poverty of the Mongeart generally prevents him from taking a plurality of wives. She is, however, liable to be divorced at will when ſhe does not bear boys; but if ſhe have the good fortune to have one or more male children, her huſband's regard for her is inconceivable. She has no longer a divorce to fear, has an abſolute authority in the tent, and paſſes her whole time in converſation, ſleep, or dancing, as ſhe thinks fit. The captive negreſſes do all her work, and are no longer aſſiſted in their labour by the Arab's wife, who treats them, on the contrary, with the greateſt harſhneſs and arrogance.

When a woman is not agreeable to her huſband, or when he is diſagreeable to her, they have it in their power to part. The formality in this caſe conſiſts in the wife's retiring to her parents. If the huſband be attached to her, he goes thither in queſt of her; but if ſhe perſiſt in refuſing to return, ſhe is free, and at liberty to marry another. If, however, ſhe have had a child, eſpecially a boy, ſhe has not the ſame privilege; in that caſe, if her retreat ſhould laſt more than eight days it might be puniſhed with death.

When a man beats his wife, it is a ſure ſign that he is ſincerely attached to her, and that he does not mean to part with her; if he content himſelf with reproaches, the wife thinks herſelf deſpiſed, and infallibly retires to her parents. Hence it is, that in the moſt trifling diſputes the women are cruelly beaten: they prefer it to the complaints that the huſband might make to their parents; this proof being the moſt certain one of a man's fondneſs for his wife. When a girl marries, ſhe makes up her mind to ſuch treatment, deeming it much more ſupportable than the humiliations ſhe would otherwiſe experience from her family, in conſequence of her huſband's complaints.

The conjugal fidelity of the Mongeart women is incorruptible. Differing in their opinions from many other Mahometans, they believe themſelves immortal like the men; but they do not flatter themſelves with the poſſibility of happineſs in the other world, unleſs they ſhall have been faithful to their huſbands in this. Women, who have been falſe to their huſband's bed, will be doomed, they think, to eternal ſlavery to the more virtuous part of their ſex, without ever partaking, in the ſmalleſt degree, of their bliſs.

Mongeart women often viſit one another; and on theſe occaſions, the honour conſiſts in letting the female who comes to ſee her friend or relation do all the work of the tent. The viſitor aſſumes the management of every thing, dreſſes the victuals, churns the butter, and keeps herſelf continually employed; while her friend entertains her with an account of the different affairs of the family or nation. The heartineſs of the welcome is meaſured by the extent of the work ſubmitted to the gueſt, who generally prepares double the uſual quantity of food; ſo that the Arab is obliged to invite his neighbours to partake of the repaſt. The ſlaves are always pleaſed with theſe entertainments, a larger portion then coming to their lot. It is the buſineſs of the viſitor to do the honours; nor will ſhe ſuffer any body about her to remain diſſatisfied.

The laws of hoſpitality are obſerved among the Mongearts as among all the wandering Arabs. Indeed they are carried to ſuch a length, that were a man to enter the tent of him whom he had wounded, or even killed, he would there meet with a ſacred and inviolable aſylum, although ſurrounded by thoſe who muſt naturally deſire his ruin. The tent of the chief is always that to which ſtrangers, upon their arrival in the horde, are directed. But the chief could not entertain, at his own expence, all the ſtrangers that happen to paſs; and therefore every tent in the horde is obliged to furniſh him with two pounds of ground barley *per* week, to enable him to maintain the ancient hoſpitality.

The chiefs of hordes are always the eldeſt of their families. The difference of wealth is not conſidered; the chief often having ſeveral individuals at his houſe richer than himſelf, who nevertheleſs obey him in every particular. He is, properly ſpeaking, their king: examines their difference with the old men, and judges without appeal. As to himſelf, he cannot be tried but by the chiefs of ſeveral hordes aſſembled. It is his buſineſs to determine the ſpots where the tents are to be pitched, the moment of departure and the place where the caravan is to ſtop. If the paſturage do not ſuffice for the herds of all the horde, it divides, and the chief aſſigns the ground for the different encampments. They are very often compoſed of no more than ſeven or eight tents, according to the quality of the ground they meet with. The tent of the chief is always the largeſt and moſt lofty, and is placed in the centre of the diviſions, When it is determined upon to quit an encampment, which never happens till the paſture is exhauſted, the chief ſets off to chooſe another ſpot. In theſe removals the women alone do all the work. Early in the morning they fold up the tent, and load every thing upon the camels backs; they then move ſlowly on, that the cattle may have time to feed upon the way.

Great reſpect is paid by the Mongearts to all old men, who enjoy the ſame prerogatives as the prieſts, and ſuch Arabs as have viſited the tomb of Mahomet at Mecca. Together with the chief they are the judges of the horde, and take cognizance of all offences, the pain of death being the only puniſhment which they cannot decree. An aſſembly of ſeveral chiefs is the only tribunal which can inflict capital puniſhment; but as the accuſed has generally a number of friends, it ſeldom happens that he is capitally convicted.

A war between two Mongeart tribes ſeldom happens, and is never bloody: but the different families deſtroy one another faſt enough in their inteſtine broils. They are all thieves; and indeed theft is a crime only in the day time, being authoriſed by law during the night, in order to compel them to take care of their cattle. Could they find redreſs when robbed by night, they would be leſs vigilant; and their herds and flocks would be more expoſed to the wild beaſts that over run their country; but being obliged to be on their guard even againſt their neareſt neighbours, they are always ready to repel both the lion and the tiger. Theft, even in the day-time, is ſo far from being puniſhed, unleſs detected at the inſtant of commiſſion, that when any thing is ſtolen unperceived, it becomes the lawful property of the thief. In vain would the rightful owner recognize it in his neighbour's tent; he cannot reclaim it; it ceaſes to be his from the moment he has been negligent in its care. Hence ariſes this people's inclination for rapine; they do not think they commit a crime, and only follow, in this regard, a cuſtom allowed by their laws.

When an Arab is going to market, or on his return from thence, if he do not take the greateſt care to keep his journey a ſecret, he is often attacked. Neighbouring Arabs are deſirous of profiting by his induſtry; and as there are no perſons in the country appointed to apprehend robbers, the hope of booty ſpurs them on to the attack. That they may have nothing to fear, they lie in wait, when the night is coming on, for him whom they mean to pillage. Their intention is never to kill; they only endeavour to ſurprize, to diſarm, and to make themſelves maſters of every thing that comes in their way. But it ſometimes happens, that the man they intend to plunder, being acquainted with the cuſtoms of his country, keeps an attentive ear, ſtands on his guard, fires upon his aſſailants at the firſt motion he obſerves, and then fights deſperately with his dagger. The report of the muſket almoſt always brings out the neighbouring Arabs, who, in virtue of the laws of hoſpitality, take the defence of the weaker ſide. They run up well armed; and then woe to the aggreſſors, if they do not ſave themſelves by a ſpeedy flight.

The flocks and herds of the Mongearts are compoſed of nothing but ſheep, goats, and camels; all animals patient of thirſt. Horſes are very ſcarce in theſe cantons, none but the poſſeſſors of numerous herds being able to keep them; becauſe, for want of water, it is neceſſary to have milk in ſufficient abundance to give it them to drink. Great care is taken to preſerve the camel's urine, both to mix with milk, and to waſh the different veſſels in which they put their food. Deteſtable as is this mixture of milk and urine, they are often reduced to the uſe of it; hunger and thirſt give a reliſh to every thing.

The only workmen uſeful to this nation are blackſmiths or goldſmiths, as they may be called indifferently. The Mongearts not being ſufficiently laborious to apply themſelves to ſuch occupations, theſe workmen come from Bilidulgerid, and diſperſe themſelves all over the different parts of the deſert. Wherever there are tents they are ſure to find work. They are fed for nothing, and receive beſides the hire for their labour. They make trinkets for the women, ſuch as ear-rings and bracelets, &c. mend the broken veſſels, by rivetting them, and clean the arms. They are generally paid in ſkins, goats and camels hair, or oſtrich feathers, according to their agreement. Thoſe who have ſilver pay them a tenth part of its weight for any thing wrought out of that metal. On their return they ſell what they have earned; four or five excurſions at moſt enabling them to live afterwards at their eaſe in their own country.

The Mongearts always carry a leathern bag, ſuſpended from their neck, in which they put their tinder, their pipe, and their tobacco. Their daggers are elegant; the hilt is always black, and inlaid with ivory; the blade is crooked, and ſharp on either ſide; the ſheath is of braſs on one ſide, and of ſilver on the other, and of very tolerable workmanſhip. They wear ſabres when they can get them, and prefer thoſe of Spaniſh make. Their muſkets are always highly ornamented; the ſtock is very ſmall, and inlaid on every ſide with ivory, and the barrel emboſſed with braſs or ſilver, according to the opulence of the owner. There is a ſpring to the lock, covering the priming, to prevent the piece from going off, contrary to the intention of him who carries it. The poor, who do not poſſeſs muſkets, wear daggers, made like the Flemiſh knives, with leathern ſheaths. They arm themſelves alſo with a thick ſtick, to the end of which they fix a kind of iron wedge. This weapon is exceedingly dangerous at cloſe quarters. Others carry *zagays*, or ſlender javelins. In a word, the principal riches of an Arab, and his higheſt gratifications, are a handſome muſket and a good dagger. He prefers them to neatneſs of apparel; for as to dreſs, it is indifferent to him whether he be clothed in Guinea blues, woollen ſtuffs, or goats ſkins. Their arms being their principal ornament, they take particular care to put the muſkets in leathern bags, by way of keeping them in good order, and preſerving them from the ruſt.

All the riches of the Mongearts conſiſt in their herds; and accordingly they take the greateſt care to preſerve them. If a beaſt be ſick, every thing is done to cure it; no care is ſpared; it is even treated with more attention than a man: but when it evidently appears that there is no hope of ſaving its life, they kill and eat it. If it be a camel, the neighbours are called in to partake of the repaſt; if a goat, the inhabitants of the tent ſuffice for its conſumption. An animal that dies without ſhedding blood is unclean. Its throat muſt be cut; the perſon who kills it turning to the eaſt, and pronouncing beforehand the firſt words of the general prayer. An animal killed by a wild boar is unclean; nor is it eaten although its blood has been ſhed, becauſe the wild boar is itſelf an unclean beaſt. That ſpecies is ſo numerous in the deſart, that they do more miſchief than all the other wild beaſts together. The Arabs kill as many as they can; but never taſte their fleſh.

Whatever loſſes an Arab may meet with, he is never heard to complain; he riſes ſuperior to poverty, ſupports hunger, thirſt, and fatigue, with patience, and his courage is proof againſt every event. God will have it ſo, ſays he: he employs, however, every means in his power to avert misfortune; and often expoſes himſelf to the greateſt dangers to procure matters of no real utility.

When a father of a family dies, all the effects in his tent are ſeized upon by the eldeſt ſon preſent at his deceaſe. Gold, ſilver, trinkets, every thing diſappears. and the abſent children have only an equal ſhare in the diviſion of the cattle and the ſlaves. The girls are entirely excluded from all participation, and take up their reſidence with their eldeſt brother. If the deceaſed leave children in helpleſs infancy, the mother takes them with her to her ſiſter's, if ſhe have a ſiſter married; if not, to her own maternal roof. The dead man's poſſeſſions, however, are not loſt; the chief of the horde takes care of them, and delivers them in equal portions to the heirs, as ſoon as they are old enough to manage their own property. If an Arab die without male children, his wife returns to her relations, and his brother inherits his effects.

The Mongearts have a rooted abhorrence of the Spaniards, and never fail to maſſacre every man of that nation who is ſo unfortunate as to be ſhipwrecked, on their coaſts, while they reſerve the women for ſale at Morocco. The reaſon of this hatred is, that the inhabitants of the Canaries make frequent deſcents on the Mongeart coaſts, and carry off men, women, cattle, and every thing that they meet with; and theſe people, being ignorant of the fate of their countrymen, retaliate by death on all Spaniards that fall into their hands, whilſt they treat the Britiſh and French as well as they can.

MONGON, on the coaſt of Peru, on the S. Pacific Ocean, is 10 leagues N. of the harbour of Guarmey, and 4 leagues from Bermejo Iſland, which lies between the former places. Caſma is 4 leagues N. of it. Mongon is known at ſea by a great mountain juſt over it, which is ſeen farther than any others on this part of the coaſt.—*Morse.*

MONGON, *Cape*, on the S. ſide of the iſland of St Domingo, is 3000 fathoms N. of Point Bahoruco and the river Nayauco, and nearly S. of the little part of Petit Trou.—*ib.*

MONHEGAN, or *Menhegan*, a ſmall iſland in the Atlantic Ocean, 12 miles ſouth-eaſterly of Pemaquid Point, in Lincoln co. Diſtrict of Maine, and in lat. 43

42. North of it are a number of ſmall iſles at the mouth of St George's river. Captain Smith landed his party here in 1614. The chimneys and remains of the houſes are yet to be ſeen.—*ib.*

MONETOU *Iſlands*, in the N. W. Territory, lie towards the E. ſide of Michigan Lake, towards its N. end, and ſouthward of Beaver Iſlands.—*ib.*

MONKTON, a townſhip in Addiſon county, Vermount, E. of Ferriſburg, and contains 450 inhabitants.—*ib.*

Monkton, a townſhip in Annapolis county, Nova-Scotia, inhabited by Acadians, and a few families from New-England. It lies partly on the baſon of Annapolis, and partly on St Mary's Bay, and conſiſts chiefly of wood-land and ſalt marſh. It contains about 60 families.—*ib.*

MONCLOVA, a town of New-Leon, N. America, ſituated S. E. of Conchos.—*ib.*

MONMOUTH, a large maritime county of New-Jerſey, of a triangular ſhape, 80 miles in length, and from 25 to 40 in breadth; bounded north by part of Raritan Bay, N. W. by Middleſex co. S. W. by Burlington, and E. by the ocean. It is divided into 6 townſhips, and contains 16,918 inhabitants, including 1596 ſlaves. The face of the county is generally level, having but few hills. The moſt noted of theſe are the high lands of Naveſink and Centre-Hill. A great part of the county is of a ſandy ſoil; but other parts are fertile. There is a very curious cave, now in ruins, at the mouth of Naveſink river, 30 feet long and 15 wide, and contains three arched apartments.—*ib.*

Monmouth, or *Freehold*, a poſt-town of New-Jerſey, and capital of the above co. ſituated 22 miles N. E. by E. of Allentown, 34 eaſt of Trenton, 14 S. W. by S. of Shrewſbury, and 64 N. E. by E. of Philadelphia. It contains a court-houſe and gaol, and a few compact dwelling-houſes. This town is remarkable for the battle fought within its limits on the 27th of June, 1778, between the armies of General Waſhington and Sir Henry Clinton. The latter having evacuated Philadelphia, was on his march to New-York. The loſs of the Americans, in killed and wounded, was about 250; that of the Britiſh, incluſive of priſoners, was about 350. The Britiſh purſued their march the night after, without the loſs of their covering party or baggage.—*ib.*

Monmouth, a ſmall poſt-town in Lincoln. co. ſituated on the eaſt ſide of Androſcoggin river, 15 miles W. by S. of Hallowell court-houſe, 5 weſterly of Winthrop, 10 N. E. by N. of Greene, 49 N. of Portland, and 180 N. by E. of Boſton.—*ib.*

Monmouth *Cape*, on the eaſt ſide of the Straits of Magellan, about half way from the ſouthern entrance of the ſecond Narrows to the ſouth-eaſt angle of the ſtraits oppoſite to Cape Forward.—*ib.*

Monmouth *Iſland*, one of the 4 iſlands of Royal Reach, in the Straits of Magellan, and the ſecond from the weſtward.—*ib.*

MONNIER (Peter Charles Le), was born at Paris on the 20th of November 1715. The profeſſion of his father, or the rank which he held in ſociety, we have not learned; and we are equally ignorant of the mode in which he educated his ſon. All that we know is, that young Monnier, from his earlieſt years, devoted himſelf to the ſtudy of aſtronomy; and that, when only ſixteen years of age, he made his firſt obſervation, viz. of the oppoſition of Saturn. At the age of twenty he was nominated a member of the Royal Academy of Sciences at Paris. In the year 1735 he accompanied Maupertuis in the celebrated expedition to Lapland, to meaſure a degree of latitude. In 1748 he went to Scotland with Lord Macclesfield, to obſerve the annular eclipſe of the ſun, which was moſt viſible in that country; and he was the firſt aſtronomer who had the pleaſure to meaſure the diameter of the moon on the diſk of the ſun.

Louis XV. it is well known, was extremely fond of aſtronomy, and greatly honoured its profeſſors: he loved and eſteemed Le Monnier. I have ſeen the king himſelf (ſays Lalande) come out of his cabinet, and look around for Le Monnier; and when his younger brother was preſented to him on his appointment to the office of firſt phyſician, his Majeſty was pleaſed to wiſh him the merit and reputation of his brother the aſtronomer. All the remarkable celeſtial phenomena were always obſerved by the king, in company with Le Monnier. Thus he obſerved with him, at his chateau of St Hubert, the two celebrated tranſits of Venus thro' the diſk of the ſun in the years 1761 and 1769; as appears from the Memoirs of the Royal Pariſian Academy of Sciences. It well deſerves to be here recorded in what manner the king behaved during theſe important obſervations, and how little he diſturbed his aſtronomers (the celebrated La Condamine being likewiſe permitted to obſerve the tranſit in his preſence) in this occupation; the proper time for which, if permitted to paſs by, could not be recalled. Le Monnier relates in his Diſſertation, that "his Majeſty perceiving that we judged the laſt contacts to be of the greateſt importance, a profound ſilence at that moment reigned around us." At the tranſit of Venus in 1769, the king allowed the Marquis de Chabert, an intelligent and expert naval officer, who was juſt returned from a literary voyage to the Levant, to aſſiſt at the obſervation. In a court like that of Louis XV. ſo ſcrupulouſly obſervant of etiquette, theſe will be allowed to have been moſt diſtinguiſhed marks of honour, and of royal favour and condeſcenſion.

In the year 1750, Le Monnier was ordered to draw a meridian at the royal Chateau of Bellevue, where the king frequently made obſervations. The monarch on this occaſion rewarded him with a preſent of 15,000 livres; but Le Monnier applied this ſum of money likewiſe in a manner that redounded to the honour of his munificent ſovereign and of his country, by procuring new and accurate inſtruments, with which he afterwards made his beſt and moſt remarkable obſervations. In 1742, the king gave him in Paris *Rue de la Poſte*, a beautiful free dwelling, where, till the breaking out of the revolution, he reſided, and purſued his aſtronomical labours, and where his inſtruments in part yet remain. Some of them the preſent French government has, at the inſtance of Lalande, purchaſed for the National Obſervatory. In 1751, the king preſented him with a block of marble, eight feet in height, ſix feet in breadth, and fifteen inches in thickneſs, to be uſed for fixing his mural quadrant of five feet. This marble wall, together with the inſtruments appended to it, turns on a large braſs ball and ſocket, by which the quadrant may be directed from ſouth to north; thus ſerving to rectify the large mural quadrant of eight feet, which is immoveably made faſt to a wall towards the ſouth.

With theſe quadrants Le Monnier obſerved, for the long period of forty years, the moon with unwearied perſeverance at all hours of the night. It is requiſite, to be a diligent aſtronomer, to be able to conceive to what numberleſs inconveniences the philoſopher is expoſed during an uninterrupted ſeries of lunar obſervations. As the moon during a revolution may paſs through the meridian at all hours of the day or night; the aſtronomer who, day after day, proſecutes ſuch obſervations, muſt be prepared at all, even the moſt inconvenient, hours, and ſacrifice to them his ſleep and all his enjoyments. How ſecluded from all the pleaſures of ſocial intercourſe, and how fatiguing ſuch a mode of life is, thoſe aſtronomers, indeed, know not who then only ſet their pendulum clocks in motion, when ſome of the eclipſes of the ſun, moon, or of the ſatellites of Jupiter, are to be viewed. At this time, and in the preſent ſtate of the ſcience, theſe are juſt the moſt inſignificant obſervations; and an able aſtronomer, well ſupplied with accurate inſtruments, may *every day*, if he take into his view the whole of his profeſſion, make more important and more neceſſary obſervations.

Le Monnier was Lalande's preceptor, and worthy of ſuch a ſcholar; and he promoted his ſtudies by his advice, and by every other means in his power. Le Monnier's penetrating mind, indeed, preſaged in young Lalande, then only ſixteen years old, what in the ſequel has been ſo ſplendidly confirmed. In his twentieth year, he became, on the recommendation of his preceptor, a member of the Royal Academy: and in 1752 he was propoſed by him as the fitteſt perſon to be ſent to Berlin, to make with La Caille's, who had been ſent to the Cape of Good Hope, correſpondent obſervations, for the purpoſe of determining the parallaxes of the moon, then but imperfectly known. Le Monnier lent his pupil for this expedition his mural quadrant of five feet. His zeal for aſtronomy knew no bounds. For this reaſon Lalande, in his *Notice des Travaux du C. Le Monnier*, ſays of himſelf: "*Je ſuis moi-meme le principal reſultat de ſon zele pour l'aſtronomie.*"

Le Monnier was naturally of a very irritable temper: as ardently as he loved his friends, as eaſily could he be offended; and his hatred was then implacable. Lalande, as he himſelf expreſſes it, had the misfortune to incur the diſpleaſure of his beloved preceptor; and he never after could regain his favour. But Lalande's gratitude and reſpect for him always continued undiminiſhed, and were on every occaſion with unremitting conſtancy publicly declared: patiently he endured from him undeſerved ill treatment; ſo much did he love and eſteem his inſtructor and maſter to the day of his death. "I have not ceaſed to exclaim (writes Lalande), as Diogenes exclaimed to his maſter Antiſthenes, You cannot find a ſtick ſtrong enough to drive me away from you!"

What a noble trait in the character of Lalande, who in 1797 wrote likewiſe an eulogium on Le Monnier in the ſtyle of a grateful pupil, penetrated with ſentiments of profound veneration and eſteem for his beloved maſter; but Le Monnier would not read it. This is not the place to give a circumſtantial account of this intricate quarrel; we ſhall only further remark, that Lalande was the warm friend and admirer of the no leſs eminent aſtronomer La Caille, whom Le Monnier mortally hated. An intimate friendſhip likewiſe ſubſiſted between Le Monnier and D'Alembert; but Lalande had no friendly intercourſe with the latter.

Among the ſcholars of Le Monnier may likewiſe be reckoned Henwart, the celebrated geometrician and profeſſor of mathematics at Utrecht; who, in a letter to Von Zach, aſtronomer to the Duke of Saxe Gotha, dated the 26th of May 1797, ſays, "Le Monnier is a penetrating and philoſophical aſtronomer: I learned much from him in Paris; though I lodged with the late De l'Iſle, where I frequently made obſervations in company with Meſſier. Le Monnier was the friend of D'Alembert; and conſequently an oppoſer of Lalande."

This great man, who had, for ſome years, ceaſed to exiſt either for the ſcience of aſtronomy, or for the comfort of his friends, died at Lizeaux, in the province of Normandy, in 1799, aged 84 years. He left behind him ſome valuable manuſcripts, and a number of good obſervations; with reſpect to which he had always been very whimſical, and of which in his latter years he never would publiſh any thing. He had by him a ſeries of lunar obſervations, and a multitude of obſervations of the ſtars, for a catalogue of the ſtars, which he had announced ſo early as the year 1741; among which was twice to be found the new planet Uranus: (See *Lalande's Aſtronomie*, *Tables*, p. 188, (A). The more he was requeſted to communicate his obſervations, the more obſtinate he became; he even threatened to deſtroy them. At the breaking out of the revolution, Lalande was greatly alarmed for the ſafety of theſe papers; he wiſhed to preſerve them from deſtruction, and made an attempt to get them into his poſſeſſion; but all his endeavours were in vain. He was only able to learn, that Le Monnier had hidden them under the roof of his houſe. Le Monnier having been firſt ſeized with a fit of the apoplexy ſo early as the 10th of November 1791, Lalande apprehended, leſt, if no one except himſelf ſhould know where he had hidden his papers, the infirm old man might perhaps have himſelf forgot it. He hopes, however, that La Grange, who married his ſecond daughter, may have ſome information concerning them. Le Monnier left behind him no ſon.

(A) Such is the French and German account of his diſcovery of this planet; but our readers have been very inattentive, if they have not perceived, in various articles of this Work, complete proofs of the plagiariſm of our neighbours on the Continent, from the celebrated philoſophers and divines of England. As it is extremely probable that, half a century hence, a claim may be put in for Le Monnier's diſcovery of the Georgium Sidus *(Uranus)*, ſimilar to that which in 1757 the editor of Abbé St Real's works put in for that Abbé being the author of Leſlie's *Short Method with the Deiſts* (ſee Leslie in this *Suppl.*), we think it our duty to declare, that in 1800 there was no evidence whatever on which to found that claim, and that the diſcovery was then univerſally allowed to have been made by Herſchel.

MONOCACY, a river which after a S. S. W. courſe, empties into the Patowmac, about 50 miles above Georgetown.—*Morse.*

MONOMIAL, in algebra, is a ſimple or ſingle nominal, conſiſting of only one term; as a or ax, or $a^2 bx^3$, &c.

MONONGAHELA *River*, a branch of the Ohio, is 400 yards wide at its junction with the Alleghany at Pittſburg. It is deep, gentle and navigable with batteaux and barges beyond Red Stone Creek, and ſtill further with lighter craft. It riſes at the foot of the Laurel Mountain in Virginia, thence meandering in a N. by E. direction, paſſes into Pennſylvania, and receives Cheat river from the S. S. E. thence winding in a N. by W. courſe, ſeparates Fayette and Weſtmoreland from Waſhington county, and paſſing into Alleghany county, joins the Alleghany river at Pittſburgh and forms the Ohio. It is 300 yards wide 12 or 15 miles from its mouth, where it receives the Youghiogany from the ſouth-eaſt, which is navigable with batteaux and barges to the foot of Laurel hill. Thence to Red Stone, at Fort Byrd, by water is 50 miles, by land 30. Thence to the mouth of Cheat river, by water 40 miles, by land 28; the width continuing at 300 yards, and the navigation good for boats. Thence the width is about 200 yards to the weſtern fork 50 miles higher, and the navigation frequently interrupted by rapids; which, however, with a ſwell of 2 or 3 feet, become very paſſable for boats. It then admits light boats, except in dry ſeaſons, 65 miles further, to the head of Tygart's Valley, preſenting only ſome ſmall rapids and falls of one or 2 feet perpendicular, and leſſening in its width to 20 yards. The weſtern fork is navigable in the winter, towards the northern branch of the Little Kanhaway, and will admit a good waggon road to it. From the navigable waters of the ſouth-eaſternmoſt branch of the Monongahela, there is a portage of 10 miles to the ſouth branch of Patowmac river. The hills oppoſite Pittſburg on the banks of this river, which are at leaſt 300 feet high, appear to be one ſolid body of coal.—*Morse.*

MONONGALIA, a county in the N. W. part of Virginia, about 40 miles long and 30 broad, and contains 4,768 inhabitants; including 154 ſlaves.—*ib.*

MONOTRIGLYPH, a term in architecture, denoting the ſpace of one triglyph between two pilaſters, or two columns.

MONPOX, a city of Terra Firma, about 75 miles S. E. by E. of Tolu.—*Morse.*

MONSEAG *Bay*, in Lincoln county, Diſtrict of Maine, is ſeparated from Sheepſcut river, by the iſland of Jeremyſquam.—*ib.*

MONSELEMINES, are a people which inhabit that part of BILEDULGERID (ſee *Encycl.*) that borders on the territories of the Emperor of Morocco. They are a mixed race, being deſcended from the ancient Arabs and fugitive Moors; and they occupy a ſpace of land, of which the limits are indicated by lofty columns placed at intervals towards the deſart. Their territory extends from about 30 leagues beyond Cape Non, to the diſtance of 20 leagues from St Croix or Agader. Though of different qualities, it is, for the moſt part, very fertile, and produces the neceſſaries of life with little cultivation. The plains are watered by an infinite number of ſtreams, and abound with palm, date, fig, and almond trees. The gardens produce excellent grapes, which are dried by the Arabs, and converted into brandy by the Jews. Great quantities of oil, wax, and tobacco, appear in the public markets.

More induſtrious and more laborious than their neighbours, the Monſelemine nation cultivates the earth. The chiefs of families chooſe the ground moſt fit for cultivation. Its ſurface is turned ſlightly over with a kind of hoe, and then the ſeed is ſown upon it: the field is ſurrounded with buſhes, to mark the ſpot, and to preſerve it from the cattle of the wandering Arabs. When the crop is ripe, which is generally at the end of Auguſt, three months after the ſowing of the ſeed, it is cut about ſix inches from the ear, and formed into little bundles; during which time every one labours without intermiſſion from morning to night. The corn is brought before the tent, thraſhed, winnowed, and placed in the magazines. When the harveſt is over, they ſet fire to the long ſtubble, and abandon the field for two or three years. Their magazines are large holes in the earth, formed like the fruſtum of a cone, the inſides of which are hardened by burning wood in them, before the half winnowed corn be depoſited. When filled with corn, they are covered with planks placed cloſe to each other; over which a layer of earth is laid level with the ſoil, to prevent it from being diſcovered by enemies. In theſe magazines every one ſhares in proportion to the number of men he employed in the common labour.

The inhabitants of the plains remain by the cultivated fields in ſeed time, and return at the time of harveſt. During the intervals they wander in all directions with their cattle, taking only neceſſaries along with them, and having recourſe to the magazines when they require a ſupply. The more opulent people, and the artizans who are engaged in ſedentary occupations, dwell in towns, which are all ſituated upon the declivity of hills. Their houſes are built of ſtone and earth, according to the Mooriſh conſtruction, low and covered with ſloping terraces; yet they are ſo much injured by the heavy rains which prevail for three months of the year, as to be rendered uninhabitable in 15 or 20 years. Thoſe who reſide in towns are generally weavers, ſhoemakers, goldſmiths, potters, &c. and have no cattle; but the more opulent perſons have flocks and herds of cows, horſes, camels, ſheep, goats, beſides poultry, which are kept by their ſlaves at a diſtance from the towns. In the towns they take two meals a day; one at ten o'clock, and the other at the ſetting of the ſun, though the inhabitants of the country only eat in the evening. In the towns they ſleep in mats upon the floors of their apartments, and make uſe of linen; but the inhabitants of the country ſleep upon terraces in the open air. The paſtoral families of the country practiſe hoſpitality like thoſe of the deſart, and make the traveller pay nothing for his entertainment. In the towns this practice is impoſſible, as the concourſe of ſtrangers, eſpecially on market-days, would ſoon impoveriſh the inhabitants. In this manner hoſpitality is always extinguiſhed among a trading and commercial people. It is only where the ſuperfluity of commodities runs neceſſarily to waſte, that it is ever practiſed in a great extent; but where every commodity can find a market, Monſelemines.

every kind of property acquires a definite value, and will be preſerved with the ſame care as money.

By M. Saugnier the government of the Monſelemines is ſaid to be republican; but he writes inconſiſtently about it. In one place, he ſays that they chooſe their chiefs annually; in another, that in the time of war they chooſe from the natives or fugitive Moors indiſcriminately, chiefs, whoſe authority laſts no longer than the campaign, during which it is abſolute; and he afterwards repreſents their government as a kind of theocracy, during war as well as peace. But we muſt follow him in his detail, as it has been well arranged in a late anonymous publication, entitled, *An Hiſtorical Sketch of Diſcoveries in Africa*.

At the end of each campaign, he ſays the chief gives an account of his actions to the aſſembled aged men, and is rewarded or puniſhed according to his conduct; after which his ſucceſſor is appointed, and he ſerves in the army he commanded as an undiſtinguiſhed individual. The country is populous, and would be ſtill more ſo, were it not for the continual wars which its inhabitants are obliged to ſupport againſt the Emperor of Morocco. The liberty they enjoy imparts energy and courage to their character, and renders their arms invincible to the Moors. They conſider it as the moſt invaluable poſſeſſion, and defend it to the laſt extremity. The nature of the country, ſurrounded on every ſide by ſteep and arid mountains, contributes to fruſtrate the efforts of their enemies. The Monſelemine, richer than the ſubject of Morocco, is always well clothed and armed. He pays no tribute, enjoys the fruit of his labour and commerce, and, as no contributions are requiſite for the charges of the ſtate, whatever he acquires is his own. The fugitive Moors are never armed, except when they go to battle; but the natives go continually armed, whether they reſide in the country, reſort to the markets, attend the aſſemblies of the nation, or pay viſits.

As the Monſelemine territory is the retreat of the rich Moors, who wiſh to fly from the tyranny of the Emperor of Morocco, they are too well acquainted with the Mooriſh cuſtoms to be ſurpriſed by that prince. No ſooner does a Mooriſh army take the field, than the inhabitants of the country cantons mount their horſes, and occupy the paſſes of the mountains; while the women and ſlaves, eſcorted by a ſufficient number of warriors, retire to the interior parts of the country, or, if they be hard preſſed, to the deſart. Among the paſtoral tribes there are many that addict themſelves entirely to arms, and ſerve as cavalry in the time of war. During peace they eſcort caravans, or exerciſe themſelves in military evolutions, and the management of their horſes. Being almoſt always on horſeback, and wearing no boots, they have a callous lump on that part of the leg that comes in contact with the iron of the ſtirrup. Their horſes, which they break in an admirable manner, are the beſt in the world: as they are treated with great care by their maſters, they know them, and are obedient to their voice, and will admit no ſtranger to mount them.

The Monſelemines derive their origin and name from Moſeilama, a contemporary of Mahomet; and, in their love of liberty, as well as in many of their cuſtoms, reſemble the Arabs of remoter times. They reſpect the prophet like other Mahometans; but neither believe that he was infallible, nor that his deſcendants are all inſpired by God, nor that their will ſhould be a law, nor that ſuch faith is neceſſary in order to be a good Mahometan. Their prieſts are reſpected, and in old age generally become the civil judges of the nation; but the influence of the high prieſt is almoſt deſpotic. Though he has no troops, he may command the nation; and war and peace depend upon his will. Though he has no property, every thing is at his diſpoſal: he requires nothing from any one, and yet all are inclined to give. He adminiſters juſtice according to the opinion of his counſel, without pretending to be inſpired by the prophet.

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On Friday the Monſelemines aſſemble in their moſques to pray: this is likewiſe the day of their principal market, when their merchandize is expoſed to ſale in the public ſquares, where the old men judge without appeal, when diſputes ariſe. Different from their neighbours of Morocco and Sahara, the Monſelemines never attempt to make proſelytes. Their Chriſtian ſlaves are treated with humanity; but they owe this to the avarice of their maſters. Theſe deteſt Chriſtians, but they love money, and are afraid leſt ſickneſs or death ſhould deprive them of the ranſom of the ſlave, or of the advantage of his labour. Among the inhabitants of the deſart, a Chriſtian, that adopts the religion of Mahomet, is admitted as a citizen and member of the family, and is preſented with cattle to form an eſtabliſhment. The Monſelemines pay more attention to the value of their property than the ſituation of the infidel. A Chriſtian who enters a moſque at Morocco is put to death, or forced to aſſume the turban. The Monſelemines would turn him civilly out, and content themſelves with impoſing the higheſt poſſible fine. Among the Moors, a Chriſtian diſcovered in an intrigue with a woman of that nation ſuffers death, or ſubmits to converſion; but the Monſelemines prefer money to religion. From them the Chriſtian has nothing to fear: the woman alone is puniſhed, being put into a ſack, and thrown into the ſea. If a Chriſtian ſlave among the neighbouring nations defends himſelf againſt his maſter, he is puniſhed with death; but money ſaves him among the Monſelemines; he would at moſt receive a ſlight correction.

The Jews are allowed the free exerciſe of their religion among the Monſelemines, but are treated with the ſame indignity as among other Mahometan tribes. A Jew is not permitted to carry arms; and if he ſhould make uſe of them againſt an Arab, he would be puniſhed with death, and probably involve his family in his fate. The Jews inhabit the towns only, where they follow trade and various arts, but are not allowed to cultivate the earth.

Polygamy is permitted, as in other Mahometan countries; but the ſituation of the women is more reſpectable, and they are not ſo much ſecluded as among the Moors. They mingle more in ſociety, walk at large, and viſit their friends; neither are their apartments ſo inviolable. Among the Monſelemines, that degrading picture of humanity is never ſeen which ſometimes occurs in Morocco, a woman drawing the plough with an aſs, a mule, or ſome other beaſt of burden. More happy than the women of the Sahara, and treated with greater attention by their huſbands, they are more humane in their diſpoſitions. Like other Arab women, they ſtain the edges of their eyelids black with henna, and paint their faces red and yellow. Their children are brought up with great care, and are not obliged to exhibit proofs of their courage before they can be conſidered as men, as is the cuſtom in the deſart. Avarice is the principal defect in the character of the Monſelemines. They hoard their money with the utmoſt care, bury it in the earth, and in many caſes die without diſcovering their ſecret even to their children. Miſers, ſays M. Saugnier, ſhould go to that country, where they would learn means of economy; which would ſhew them, that, in compariſon with the Monſelemines, they are themſelves perfect prodigals.

The medicinal applications of the Monſelemines, which differ not from thoſe of the MONGEARTS and other inhabitants of the deſart, are extremely ſimple, but appear ſufficiently complex from the mummery of the prieſts, who are the depoſitories of their medical ſcience. Fleſh wounds are cauteriſed with a hot iron, and then covered with herbs dipped in turtles oil and tar. In headachs, a compreſs is applied with ſuch violence that the blood ſtarts from the forehead. In internal diſeaſes, the general remedies are regimen, reſt, and a few maxims of the Koran myſteriouſly applied to the affected parts.

MONSON, a townſhip in Hampſhire county, Maſſachuſetts, E. of Brimfield, and 80 miles ſouth-weſt by weſt of Boſton. It was incorporated in 1760, and contains 1331 inhabitants.—*Morſe*.

MONSIES, the third tribe in rank of the Delaware nation of Indians.—*ib*.

MONTAGUE, a townſhip in Hampſhire co. Maſſachuſetts, on the E. bank of Connecticut river, between Sunderland and Wendel, about 18 miles north of Northampton, and 97 miles weſt by north of Boſton. It was incorporated in 1753, and contains 906 inhabitants. A company was incorporated in 1792 to build a bridge over the river here. The work has not yet been completed—*ib*.

MONTAGUE, the northernmoſt townſhip in New-Jerſey, is ſituated in Suſſex co. on the eaſt ſide of Delaware river, about 5 miles N. E. of Minifink, and 17 north of Newtown. It contains 543 inhabitants, including 25 ſlaves.—*ib*.

MONTAGUE, the largeſt of the ſmall iſlands in Prince William's Sound, on the N. W. coaſt of North-America.—*ib*.

MOTAUK *Point*, the eaſtern extremity of Long-Iſland, New-York. A tract here, called *Turtle Hill*, has been ceded to the U. States for the purpoſe of building a light-houſe thereon.—*ib*.

MONTE *Chriſt*, a cape, bay, town, and river, on the north ſide of the iſland of St Domingo. The cape is a very high hill, in the form of a tent, called by the French, *Cape la Grange*, or *Barn*. It is ſituated in lat. 19 54 30 N. and in long. 74 9 30 W. of Paris. A ſtrip of level land joins it to the territory of Monte Chriſt, and it is owing to this that the cape has been taken for an iſland. It is 14 leagues N. E. by E. of Cape Francois, where it may be ſeen in a clear day, with the naked eye. After doubling this cape, we find the bay of Monte Chriſt running nearly S. W. It is formed by Cape la Grange, on one ſide, and Pointe des Dunes (Down Point) on the other; about 6,500 fathoms aſunder. The bay is about 1,400 fathoms deep, and its winding is nearly 4 leagues. About 900 fathoms from the cape, deſcending the bay, we find the little iſland of Monte Chriſt, 350 fathoms from the ſhore. One may ſail between the two, with 2, 4, and 5 fathoms water; and about 250 fathoms further on, is anchorage in from 6 to 10 fathoms. A league and a quarter from Cape la Grange, is a battery intended to protect a landing place, of 100 fathoms wide, which is below, and oppoſite the town of Monte Chriſt. The town of Monte Chriſt, ſtanding at 800 fathoms from the ſea ſide, riſes in an amphitheatre on the ſide of the coaſt, which is very high all round this bay. The town is 200 fathoms ſquare, which ſpace is divided into 9 parts, cut by two ſtreets running from E. to W. and two others from N. to S. It was founded in 1533, abandoned in 1606, and now but a poor place, deſtitute of every reſource but that of cattle raiſed in its territory, and ſold to the French. The town and territory contain about 3,000 ſouls. There is a trifling garriſon at Monte Chriſt. About a league from the battery, following the winding of the bay, is the river of Monte Chriſt, or more properly, the river Yaqui. The land round the town is barren and ſandy; and the river contains great numbers of crocodiles. Monte Chriſt is a port well known to American ſmugglers, and carries on a great commerce from its vicinity to the French plantations. In the time of peace, all the produce of the plain of Mariboux ſituated between Port Dauphin and Mancenille Bay, is ſhipped here, and in a war between France and Britain, it uſed to be a grand market, to which all the French in the north part of the iſland ſent their produce, and where purchaſers were always ready.—*ib*.

MONTE *Chriſt*, a chain of mountains which extend parallel to the north coaſt of the iſland of St Domingo, from the bay of Monte Chriſt, to the bay of Samana on the E. Two large rivers run in oppoſite directions along the ſouthern ſide of this chain. The river Monte Chriſt or Yaqui in a W. by S. direction, and Yuna river in an E. by S. courſe to the bay of Samana. They both riſe near La Vega, and have numerous branches.—*ib*.

MONTEGO *Bay* is on the N. ſide of the iſland of Jamaica, 20 miles E. by N. of Lucea harbour, and 21 W. of Martha Brae. This was formerly a flouriſhing and opulent town: it conſiſted of 225 houſes, 33 of which were capital ſtores, and contained about 600 white inhabitants. The number of topſail veſſels which cleared annually at this port were about 150, of which 70 were capital ſhips; but in this account are included part of thoſe which entered at Kingſton. This fine town was almoſt totally deſtroyed by an accidental fire, in July, 1795; the damage was eſtimated at £200,000 ſterling.—*ib*.

MONTEREY BAY, in North California, was viſited in 1786 by La Perouſe, who places it in 36° 58′ 43″ N. Lat. and 124° 40′ W. Long. from Paris. It is formed by New-year Point to the north, and by that of Cyprus to the ſouth; has an opening of eight leagues in this direction, and nearly ſix of depth to the eaſtward, where the land is ſandy and low. The ſea breaks there as far as the foot of the ſandy downs with which the coaſt is ſurrounded, with a roaring which may be heard more than a league off. The lands north and

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ſouth of this bay are high, and covered with trees. Thoſe ſhips which are deſirous of touching there ought to follow the ſouth coaſt, and after having doubled the Point of Pines, which ſtretches to the northward, they get ſight of the preſidency, and may come to an anchor in ten fathoms within it, and a little within the land of this point, which ſhelters from the winds from the offing. The Spaniſh ſhips, which propoſe to make a long ſtay at Monterey, are accuſtomed to bring up within one or two cables lengths of the land, in ſix fathoms, and make faſt to an anchor, which they bury in the ſand of the beach; they have then nothing to fear from the ſoutherly winds, which are ſometimes very ſtrong; but, as they blow from the coaſt, do not expoſe them to any danger. The two French frigates, which our author commanded, found bottom over the whole bay, and anchored four leagues from the land, in 60 fathoms, ſoft muddy ground; but there is a very heavy ſea, and it is only an anchorage fit for a few hours, in waiting for day, or the clearing up of the fog. At full and change of the moon it is high water at half paſt one o'clock: the tide riſes ſeven feet; and as this bay is very open, the current in it is nearly imperceptible. It abounds with whales; a genus of fiſhes, of which our *ſcientific* voyagers knew ſo little, that they were ſurpriſed at their ſpouting water!

The coaſts of Monterey Bay are almoſt continually enveloped in fogs, which cauſe great difficulty in the approach to them. But, for this circumſtance, there would be few more eaſy to land upon; there is not any rock concealed under water that extends a cable's length from the ſhore; and if the fog be too thick, there is the reſource of coming to an anchor, and there waiting for a clear, which will enable you to get a good ſight of the Spaniſh ſettlement, ſituated in the angle formed by the ſouth and eaſt coaſt. The ſea was covered with pelicans. Theſe birds, it ſeems, never go farther than five or ſix leagues from the land; and navigators, who ſhall hereafter meet with them during a fog, may reſt aſſured that they are within that diſtance of it.

A lieutenant-colonel, whoſe reſidence is at Monterey, is governor of the Californias: the extent of his government is more than 800 leagues in circumference, but his real ſubjects conſiſt only of 282 cavalry, whoſe duty it is to garriſon five ſmall forts, and to furniſh detachments of four or five men to each of the 25 miſſions, or pariſhes, eſtabliſhed in old and new California. So ſmall are the means which are adequate to the reſtraining about 50,000 wandering Indians in this vaſt part of America, among whom, nearly 10,000 have embraced Chriſtianity. Theſe Indians are, in general, ſmall and weak (A), and diſcover none of that love of liberty and independence which characteriſes the northern nations, of whoſe arts and induſtry they are alſo deſtitute. Their colour very nearly approaches that of the negroes whoſe hair is not woolly; the hair of theſe people is ſtrong, and of great length; they cut it four or five inches from the roots. Several among them have a beard; others, according to the miſſionary fathers, have never had any; and this is a queſtion which is even undecided in the country. The governor, who had travelled a great way into the interior of theſe lands, and who had paſſed 15 years of his life among the ſavages, aſſured our author, that thoſe who had no beards had plucked them up with bivalve ſhells, that ſerved them as pincers: the preſident of the miſſions, who had reſided an equal length of time in California, maintained the contrary;—it was difficult, therefore, for travellers to decide between them." The difficulty, ſurely, was not great. By their own account, the governor had travelled much farther into the country than the miſſionary; and his report being confirmed by the evidence of their own ſenſes, was intitled to unlimited credit.

Theſe Indians are extremely ſkilful in drawing the bow; they killed, in the preſence of the French, the ſmalleſt birds: it is true, they diſplay an inexpreſſible patience in approaching them; they conceal themſelves, and, as it were, glide along near to the game, ſeldom ſhooting till within 15 paces. Their induſtry in hunting the larger animals is ſtill more admirable. Perouſe ſaw an Indian, with a ſtag's head fixed upon his own, walk on all-fours, as if he were browſing the graſs; and he played this pantomime to ſuch perfection, that all the French hunters would have fired at him at 30 paces, had they not been prevented. In this manner they approach herds of ſtags within a very ſmall diſtance, and kill them with a flight of arrows.

Before the Spaniſh ſettlements, the Indians of California cultivated nothing but maize, and almoſt entirely lived by fiſhing and hunting. There is not any country in the world which more abounds in fiſh and game of every deſcription: hares, rabbits, and ſtags are very common there; ſeals and otters are alſo found there in prodigious numbers; but to the northward, and during the winter, they kill a very great number of bears, foxes, wolves, and wild cats. The thickets and plains abound with ſmall grey tufted partridges, which, like thoſe in Europe, live in ſociety, but in large companies of three or four hundred; they are fat, and extremely well flavoured. The trees ſerve as habitations to the moſt delightful birds; and the ornithologiſts of the voyage ſtuffed a great variety of ſparrows, titmice, ſpeckled wood-peckers, and tropic birds. Among the birds of prey are found the white-headed eagle, the great and ſmall falcon, the goſs hawk, the ſparrow hawk, the black vulture, the large owl, and the raven. On the ponds and ſea-ſhore are ſeen the wild duck, the grey and white pelican with yellow tufts, different ſpecies of gulls, cormorants, curlews, ring-plovers, ſmall ſea water hens, and herons; together with the bee-eater, which, according to moſt ornithologiſts, is peculiar to the old continent.

The country about Monterey Bay is inexpreſſibly fertile. The crops of maize, barley, corn, and peaſe, cannot be equalled but by thoſe of Chili; the European cultivators can have no conception of a ſimilar fertility; the medium produce of corn is from ſeventy to eighty for one; the extremes ſixty and a hundred. Fruit trees are ſtill very rare there, but the climate is extremely ſuitable to them: it differs a little from that of the ſouthern French provinces. The foreſt trees are, the ſtone-pine, cyprus, evergreen oak, and occidental plane tree. There is no underwood; and a verdant carpet,

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(A) The chief ſurgeon of the expedition ſays they are *ſtrong*, but ſtupid.

Monterey.

pet, over which it is very agreeable to walk, covers the ground. There are alſo vaſt ſavannahs, abounding with all ſorts of game.

Perouſe writes with great reſpect of the wiſe and pious conduct of the Spaniſh miſſionaries at Monterey, who ſo faithfully fulfil the purpoſe of their inſtitution. Totally unlike the monks at CONCEPTION in Chili (ſee that article in this *Suppl.*), they have left the lazy life of a cloiſter, to give themſelves up to cares, fatigues, and ſolicitudes of every kind. They invited the officers of the frigates to dine with them at their monaſtery, contiguous to which ſtands the Indian village, conſiſting of about 50 cabins, which ſerve as dwelling-places to 740 perſons of both ſexes, compriſing their children, which compoſe the miſſion of Saint Charles, or of Monterey. Theſe cabins are the moſt miſerable that are to be met with among any people; they are round, ſix feet in diameter, by four in height; ſome ſtakes, of the ſize of an arm, fixed in the earth, and which approach each other in an arch at the top, compoſe the timber work of it; eight or ten bundles of ſtraw, very ill arranged over theſe ſtakes, defend the inhabitants, well or ill, from the rain and wind; and more than half of this cabin remains open when the weather is fine; their only precaution is to have each of them two or three bundles of ſtraw at hand by way of reſerve.

All the exhortations of the miſſionaries have never been able to procure a change of this general architecture of the two Californias. The Indians ſay, that they like plenty of air; that it is convenient to ſet fire to their houſes when they are devoured in them by too great a quantity of fleas; and that they can build another in leſs than two hours. The independent Indians, who as hunters ſo frequently change their places of abode, have a ſtronger motive.

The monks gave the moſt complete information reſpecting the government of this ſpecies of religious community; for no other name can be given to the legiſlation they have eſtabliſhed. They are ſuperiors both in ſpiritual and temporal affairs: the products of the land are entirely entruſted to their adminiſtration. There are ſeven hours allotted to labour in the day, two hours to prayers, and four or five on Sundays and feſtivals, which are altogether dedicated to reſt and divine worſhip. Corporal puniſhments are inflicted on the Indians of both ſexes who neglect pious exerciſes; and ſeveral ſins, the puniſhment of which in Europe is reſerved only to Divine Juſtice, are puniſhed with chains or the ſtocks.

The Indians, as well as the miſſionaries, riſe with the ſun, and go to prayers and maſs, which laſt an hour; and during this time there is cooked in the middle of the ſquare, in three large kettles, barley meal, the grain of which has been roaſted previous to being ground; this ſpecies of boiled food, which the Indians call *atole*, and of which they are very fond, is ſeaſoned neither with ſalt nor butter, and to us would prove a very inſipid meſs. Every cabin ſends to take the portion for all its inhabitants in a veſſel made of bark: there is not the leaſt confuſion or diſorder; and when the coppers are empty, they diſtribute that which ſticks to the bottom to the children who have beſt retained their leſſons of catechiſm. This meal continues three quarters of an hour, after which they all return to their labours; ſome go to plough the earth with oxen, others to dig the garden; in a word, every one is employed in different domeſtic occupations, and always under the ſuperintendance of one or two of the religious.

The women are charged with little elſe but the care of their houſewifery, their children, and roaſting and grinding the ſeveral grains: this laſt operation is very long and laborious, becauſe they have no other means of doing it but by cruſhing the grain in pieces with a cylinder upon a ſtone. M. de Langle, being a witneſs of this operation, made the miſſionaries a preſent of his mill; and a greater ſervice could not have been rendered them, as by theſe means four women would in a day perform the work of a hundred, and time enough will remain to ſpin the wool of their ſheep, and to manufacture coarſe ſtuffs.

At noon the dinner was announced by the bell; the Indians quitted their work, and ſent to fetch their rations in the ſame veſſels as at breakfaſt: but this ſecond meſs was thicker than the firſt; there was mixed in it corn and maize, and peaſe and beans; the Indians name it *pouſſole*. They return again to their labour from two o'clock till four or five; afterwards they attend evening prayers, which continue near an hour, and are followed by a new ration of *atole* like that at breakfaſt. Theſe three diſtributions are ſufficient for the ſubſiſtence of the far greater number of Indians; and this very economical ſoup might perhaps be very profitably adopted in our years of ſcarcity; ſome ſeaſoning would certainly be neceſſary to be added to it, their whole knowledge of cookery conſiſting in being able to roaſt the grain before it is reduced into meal. As the Indian women have no veſſels of earth or metal for this operation, they perform it in large baſkets made of bark, over a little lighted charcoal; they turn theſe veſſels with ſo much rapidity and addreſs, that they effect the ſwelling and burſting of the grain without burning the baſket, though it is made of very combuſtible materials.

The corn is diſtributed to them every morning; and the ſmalleſt diſhoneſty, when they give it out, is puniſhed by whipping: but it is very ſeldom, indeed, they are expoſed to it. Theſe puniſhments are adjudged by Indian magiſtrates, called *caciques*; there are in every miſſion three of them, choſen by the people from amongſt thoſe whom the miſſionaries have not excluded: but theſe caciques are like the governors of a plantation, paſſive beings, blind executors of the will of their ſuperiors; and their principal functions conſiſt in ſerving as beadles in the church, and their maintaining order and an air of contemplation. The women are never whipped in public, but in an incloſed and ſomewhat diſtant place, leſt perhaps their cries might inſpire too lively a compaſſion, which might ſtimulate the men to revolt; theſe laſt, on the contrary, are expoſed to the view of all their fellow-citizens, that their puniſhment may ſerve as an example. In general they aſk pardon; in which caſe the executioner leſſens the force of his laſhes, but the number of them is never receded from.

The rewards are particular ſmall diſtributions of grain, of which they make little thin cakes, baked on burning coals: and on the great feſtivals the ration is in beef; many of them eat it raw, eſpecially the fat, which they eſteem equal to the beſt butter or cheeſe. They ſkin all animals with the greateſt addreſs; and when they are fat, they make, like the ravens, a croaking of pleaſure, devouring, at the ſame time, the moſt delicate parts with their eyes.

They are frequently permitted to hunt and fiſh on their own account; and on their return they generally make the miſſionaries ſome preſent in game and fiſh; but they always proportion the quantity to what is abſolutely neceſſary for them, always taking care to increaſe it if they hear of any new gueſts who are on a viſit to their ſuperiors. The women rear fowls about their cabins, the eggs of which they give their children. Theſe fowls are the property of the Indians, as well as their clothes, and other little articles of houſehold furniture, and thoſe neceſſary for the chace. There is no inſtance of their having robbed each other, though their faſtenings to the doors conſiſt only of a ſimple bundle of ſtraw, which they place acroſs the entrance when all the inhabitants are abſent.

The men in the miſſions have ſacrificed much more to Chriſtianity than the women; becauſe they were accuſtomed to polygamy, and were even in the cuſtom of eſpouſing all the ſiſters of a family. The women, on the other hand, have acquired the advantage of excluſively receiving the careſſes of one man only. With this, however, it would appear that they are not ſatisfied; for the religious have found it neceſſary to conſtitute themſelves the guardians of female virtue. At an hour after ſupper, they have the care of ſhutting up, under lock and key, all thoſe whoſe huſbands are abſent, as well as the young girls above nine years of age; and during the day they are entruſted to the ſuperintendance of the matrons. So many precautions are ſtill inſufficient; for our voyagers ſaw men in the ſtocks, and women in irons, for having deceived the vigilance of theſe female arguſſes, who had not been ſufficiently ſharp-ſighted.

The converted Indians have preſerved all the ancient uſages which their new religion does not prohibit; the ſame cabins, the ſame games, the ſame dreſſes: that of the richeſt conſiſts of an otter's ſkin cloak, which covers their loins, and deſcends below their groin; the moſt lazy have only a ſimple piece of linen cloth, with which they are furniſhed by the miſſion, for the purpoſe of hiding their nakedneſs; and a ſmall cloak of rabbit's ſkin covers their ſhoulders, which is faſtened with a pack-thread under the chin; the head and the reſt of the body is abſolutely naked; ſome of them, however, have hats of ſtraw, very neatly matted. The women's dreſs is a cloak of deer ſkin, ill tanned; thoſe of the miſſions have a cuſtom of making a ſmall boddice, with ſleeves, of them: it is their only apparel, with a ſmall apron of ruſhes, and a petticoat of ſtag's ſkin, which covers their loins, and deſcends to the middle of the leg. The young girls, under nine years of age, have merely a ſimple girdle; and the children of the other ſex are quite naked.

The independent ſavages are very frequently at war; but the fear of the Spaniards makes them reſpect their miſſions; and this, perhaps, is not one of the leaſt cauſes of the augmentation of the Chriſtian villages. Their arms are the bow, and arrow pointed with a flint very ſkilfully worked: theſe bows are made of wood, and ſtrung with the ſinews of an ox. Our author was aſſured, that they neither eat their priſoners, nor their enemies killed in battle; that, nevertheleſs, when they had vanquiſhed, and put to death on the field of battle, chiefs, or very courageous men, they have eaten ſome pieces of them, leſs as a ſign of hatred or revenge, than as a homage which they paid to their valour, and in the full perſuaſion that this food would be likely to increaſe their own courage. They ſcalp the vanquiſhed as in Canada, and pluck out their eyes; which they have the art of preſerving free from corruption, and which they carefully keep as precious ſigns of their victory. Their cuſtom is to burn their dead, and to depoſit their aſhes in morais.

MONTEVIDEO, a bay and town of La Plata or Paraguay, in S. America, ſituated on the northern ſide of La Plata river, in lat. 34 30 S. It lies E. of Buenos Ayres, and has its name from a mountain which overlooks it, about 20 leagues from Cape Santa Maria at the mouth of the Plata.—*Morse.*

MONTGOMERY, a new county in the Upper diſtrict of Georgia.—*ib.*

Montgomery, a county of New-York, at firſt called Tryon, but its name was changed to Montgomery in 1784, by act of the Legiſlature. It conſiſted of 11 townſhips, which contained 28,848 inhabitants, according to the cenſus of 1791. Since that period the counties of Herkemer and Otſego have been erected out of it. It is now bounded N. and W. by Herkemer, E. by Saratoga, S. by Schoharie, and S. W. by Otſego county. By the State cenſus of 1796, it is divided into 8 townſhips; and of the inhabitants of theſe 3,379 are qualified electors. Chief town, Johnſton.—*ib.*

Montgomery, a townſhip in Ulſter county, New-York, bounded eaſterly by New-Windſor and New-burgh, and contains 3,563 inhabitants, including 236 ſlaves. By the State cenſus of 1796, 497 of the inhabitants were qualified electors.—*ib.*

Montgomery, a fort in New-York State, ſituated in the High Lands, on the W. bank of Hudſon's river, on the N. ſide of Popelop's creek, on which are ſome iron-works, oppoſit St Anthony's Noſe, 6 miles S. of Weſt-Point, and 52 from New-York city. The fort is now in ruins. It was reduced by the Britiſh in October, 1777.—*ib.*

Montgomery, a townſhip in Franklin county, Vermont.—*ib.*

Montgomery, a townſhip in Hampſhire county, Maſſachuſets, 100 miles from Boſton. It was incorporated in 1780, and contains 449 inhabitants.—*ib.*

Montgomery, a county in Pennſylvania, 33 miles in length, and 17 in breadth, N. W. of Philadelphia county. It is divided into 26 townſhips, and contains 22,929 inhabitants, including 114 ſlaves. In this county are 96 griſt-mills, 61 ſaw-mills, 4 forges, 6 fulling-mills, and 10 paper-mills. Chief town, Norriſtown.—*ib.*

Montgomery, a townſhip in the above county. There is alſo a townſhip of this name in Franklin county.—*ib.*

Montgomery, a county in Saliſbury diſtrict, N. Carolina, containing 4,725 inhabitants, including 834 ſlaves.—

Montgomery, a county of Virginia, S. of Botetourt county. It is about 100 miles in length, and 44 in breadth, and contains ſome lead mines. Chief town, Chriſtianſburg.—*ib.*

Montgomery *Court-Houſe* in Virginia, is 28 miles from Anſon court-houſe, 46 from Wythe court-houſe, and 40 from Saliſbury. It is on the poſt-road from Richmond to Kentucky. A poſt-office is kept here.—*ib.*

MONTGOMERY, a county of Maryland, on Patowmac river. It contains 18,003 inhabitants, including 6030 ſlaves.—*ib.*

MONTGOMERY *Court Houſe*, in the above county, is 28 miles S. E. by S. of Frederickſtown, 14 N. by W. of Georgetown on the Patowmac, and 35 ſouth-weſterly of Baltimore.—*ib.*

MONTGOMERY, a new county in Tenneſſee State, Mero diſtrict. This and Robertſon county, are the territory formerly called *Teneſſee County*, the name of which ceaſes ſince the State has taken that name.—*ib.*

MONTMORIN, a new town on the north bank of Ohio river, 18 miles below Pittſburg, ſituated on a beautiful plain, very fertile, and abounding with coal.—*ib.*

MONTPELIER, a townſhip in Caledonia county, Vermont, on the N. E. ſide of Onion river. It has 118 inhabitants, and is 43 miles from Lake Champlain.—*ib.*

MONTREAL, the ſecond city in rank in Lower Canada, ſtands on an iſland in the river St Lawrence, which is 10 leagues in length and 4 in breadth, and has its name from a very high mountain about the middle of it, which it ſeems to overlook like a monarch from his throne; hence the French called it *Mont-real* or *Royal Mountain.* While the French had poſſeſſion of Canada, both the city and iſland of Montreal belonged to private proprietors, who had improved them ſo well that the whole iſland had become a delightful ſpot, and produced every thing that could adminiſter to the convenience of life. The city, around which is a very good wall, built by Louis XIV. of France, forms an oblong ſquare, divided by regular and well formed ſtreets; and when taken by the Britiſh, the houſes were built in a very handſome manner; and every houſe might be ſeen at one view from the harbour, or from the ſouthernmoſt ſide of the river, as the hill on the ſide of which the town ſtands falls gradually to the water. Montreal contains about 600 houſes, few of them elegant; but ſince it fell into the hands of the Britiſh in 1760, it has ſuffered much from fire. A regiment of men are ſtationed here, and the government of the place borders on the military. It is about half a league from the ſouth ſhore of the river, 170 miles ſouth-weſt of Quebec, Trois Rivieres being about half way; 110 north by weſt of Crown Point; 308 north by weſt of Boſton, and 350 north by eaſt of Niagara. North lat. 45 35, weſt long. 73 11. The river St Lawrence is about 3 miles wide at Montreal. There is an iſland near the middle of the river oppoſite the city, at the lower end of which is a mill with 8 pair of ſtones, all kept in motion, at the ſame time, by 1 wheel. The works are ſaid to have coſt £11,000 ſterling. A large mound of ſtone, &c. built out into the river, ſtops a ſufficiency of water to keep the mill in continual motion. And what is very curious, at the end of this mound or dam, veſſels paſs againſt the ſtream, while the mill is in motion. Perhaps there is not another mill of the kind in the world.—*ib.*

MONTREAL, a river which runs north-eaſtward into lake Superior, on the ſouthern ſide of the lake.—*ib.*

MONTREAL *Bay* lies towards the eaſt end of lake Superior, having an iſland at the north-weſt ſide of its entrance, and north-eaſt of Caribou iſland.—*ib.*

MONTROUIS, a town in the weſt part of the iſland of St Domingo, at the head of the Bight of Leogane, 5 leagues ſouth-eaſt of St Mark, and 15 north-weſt of Port au Prince.—*ib.*

MONTSERRAT, one of the Caribbee iſlands, and the ſmalleſt of them in the Atlantic Ocean. Columbus diſcovered it in 1493. It is of an oval form, 3 leagues in length, and as many in breadth, containing about 30,000 acres of land, of which almoſt ⅔ds are very mountainous, or very barren. The cultivation of ſugar occupies 6,000 acres; cotton, proviſion and paſturage have 2,000 acres allotted for each. No other tropical ſtaples are raiſed. The productions were, on an average, from 1784 to 1788, 2,737 hhds. of ſugar, of 16 cwt. each, 1,107 puncheons of rum, and 275 bales of cotton. The total exports from Montſerrat and Nevis in 1787 were in value £214,141 : 16 : 8, of which the value of £13,981 : 12 . 6 was exported to the American States. The inhabitants of Montſerrat amount to 1,300 whites, and about 10,000 negroes. The firſt ſettlers, in 1632, were Iriſhmen, and the preſent inhabitants are chiefly their deſcendants, or other natives of Ireland ſince ſettled there, by which means the Iriſh language is preſerved there even among the negroes. The iſland is ſurrounded with rocks, and the riding before it is very precarious and dangerous on the approach of a tornado, having no haven. It has only 3 roads, viz. Plymouth, Old Harbour, and Ker's Bay; where they are obliged to obſerve the ſame methods as at St Chriſtopher's in loading or unloading the veſſels. It lies 30 miles ſouth-weſt of Antigua; the ſame diſtance ſouth-eaſt of Nevis, and is ſubject to Great-Britain. N. lat. 16 47, weſt long. 62 12.—*ib.*

MONTSIOUGE, a river or bay in Lincoln county, Diſtrict of Maine, which communicates with the rivers Sheepſcut and Kennebeck.—

MONTVILLE, a townſhip in New-London county, Connecticut, about 10 miles N. of New-London city. It has 2,053 inhabitants.—*ib.*

MONUMENT *Bay*, on the eaſt coaſt of Maſſachuſetts, is formed by the bending of Cape Cod. It is ſpacious and convenient for the protection of ſhipping.—*ib.*

MOORE, a county of N. Carolina, in Fayette diſtrict. It contains 3,770 inhabitants, including 371 ſlaves. Chief town, Alfordſton.—*ib.*

MOORE *Court-Houſe*, in the above county, where a poſt-office is kept, is 38 miles from Randolph court-houſe, and 40 from Fayetteville.—*ib.*

MOOREFIELD, in New-Jerſey, 13 miles eaſterly of Philadelphia.—*ib.*

MOORE *Fort*, a place ſo called in S. Carolina, is a ſtupendous bluff, or high perpendicular bank of earth, on the Carolina ſhore of Savannah river, perhaps 90 or 100 feet above the common ſurface of the water, exhibiting the ſingular and pleaſing ſpectacle to a ſtranger, of prodigious walls of parti-coloured earths, chiefly clays and marl, as red, brown, yellow, blue, purple, white, &c. in horizontal ſtrata, one over the other. A fort formerly ſtood here, before the erection of one at Auguſta, from which it ſtood a little to the north-eaſt. The water now occupies the ſpot on which the fort ſtood.—*ib.*

MOORE'S *Creek* is 16 miles from Wilmington, in N. Carolina. Here Gen. M'Donald, with about 2,000 royaliſts, were defeated (after a retreat of 80 miles, and a deſperate engagement) by Gen. Moore, at the head of 800 continentals. Gen. M'Donald and the flower of his men were killed.—*ib.*

MOORFIELDS, a poſt-town and the capital of Hardy county, Virginia, ſituated on the eaſt ſide of the ſouth branch of Patowmac river. It contains, a court-houſe, a gaol, and between 60 and 70 houſes. It is 25 miles from Romney, 75 from Wincheſter, and 180 from Richmond.—*ib.*

MOORS, in common language, are the natives of Morocco, of whom an account is given under that title in the *Encyclopædia;* but there is another people, a mixed race, called alſo Moors, who lead a wandering and paſtoral life in the habitable parts of the Great Deſert, and in the countries adjacent to it. Of the origin of theſe Mooriſh tribes, as diſtinguiſhed from the inhabitants of Barbary, nothing farther ſeems to be known than what is related by John Leo the African; whoſe account may be abridged as follows:

Before the Arabian conqueſt, about the middle of the ſeventh century, all the inhabitants of Africa, whether they were deſcended from Numidians, Phœnicians, Carthaginians, Romans, Vandals, or Goths, were comprehended under the general name of *Mauri* or Moors. All theſe nations were converted to the religion of Mahomet, during the Arabian empire under the Kaliphs. About this time many of the Numidian tribes, who led a wandering life in the deſert, and ſupported themſelves upon the produce of their cattle, retired ſouthward acroſs the Great Deſart, to avoid the fury of the Arabians; and by one of thoſe tribes, ſays Leo (that of Zanhaga), were diſcovered, and conquered, the Negro nations on the Niger. By the Niger, is here undoubtedly meant the river of Senegal which in the Mandingo language is called *Bafing*, or the Black River.

To what extent theſe people are now ſpread over the African continent, it is difficult to aſcertain. There is reaſon to believe, that their dominion ſtretches from weſt to eaſt, in a narrow line or belt, from the mouth of the Senegal (on the northern ſide of that river) to the confines of Abyſſinia. Mr Park deſcribes them as reſembling, in complexion, the Mulattoes of the Weſt Indies, and as having cruelty and low cunning pictured in their countenances. "From the ſtaring wildneſs in their eyes (ſays he), a ſtranger would immediately ſet them down as a nation of lunatics. The treachery and malevolence of their character are manifeſted in their plundering excurſions againſt the Negro villages. Oftentimes, without the ſmalleſt provocation, and ſometimes under the faireſt profeſſions of friendſhip, they will ſuddenly ſeize upon the Negroes cattle, and even on the inhabitants themſelves. The Negroes very ſeldom retaliate. The enterpriſing boldneſs of the Moors, their knowledge of the country, and, above all, the ſuperior fleetneſs of their horſes, make them ſuch formidable enemies, that the petty Negro ſtates, which border upon the deſert, are in continual alarm while the Mooriſh tribes are in the vicinity, and are too much awed to think of reſiſtance.

"Like the roving Arabs, the Moors frequently remove from one place to another, according to the ſeaſon of the year, or the convenience of paſturage. In the month of February, when the heat of the ſun ſcorches up every ſort of vegetation in the deſert, they ſtrike their tents, and approach the Negro country to the ſouth; where they reſide until the rains commence, in the month of July. At this time, having purchaſed corn, and other neceſſaries from the Negroes, in exchange for ſalt, they again depart to the northward, and continue in the deſert until the rains are over, and that part of the country becomes burnt up and barren.

"This wandering and reſtleſs way of life, while it inures them to hardſhips, ſtrengthens, at the ſame time, the bonds of their little ſociety, and creates in them an averſion towards ſtrangers, which is almoſt inſurmountable. Cut off from all intercourſe with civilized nations, and boaſting an advantage over the Negroes, by poſſeſſing, though in a very limited degree, the knowledge of letters, they are at once the vaineſt and proudeſt, and perhaps the moſt bigotted, ferocious, and intolerant, of all the nations on the earth; combining in their character the blind ſuperſtition of the Negro, with the ſavage cruelty and treachery of the Arab." But for them Mr Park would have accompliſhed the utmoſt object of his miſſion, and have reached Tombuctoo, and even Houſſa, with no other danger than what ariſes neceſſarily from the climate, from wild beaſts, and from the poor accommodation afforded in the huts of the hoſpitable Negroes. The wandering Moors, however, have all been taught to regard the Chriſtian name with inconceivable abhorrence; and to conſider it nearly as lawful to murder a European as it would be to kill a dog. It is, therefore, much leſs ſurpriſing that our traveller did not proceed farther along the banks of the Niger, than that he eſcaped the ſnares of ſo relentleſs a people.

MOOSE *River*, riſes in Miſinabe lake, a ſhort diſtance from Michipicoten river, a water of lake Superior, and purſues a north-eaſtern courſe, receiving, about 12 miles from its mouth, a large ſouth branch, and empties into the ſouthern part of James's Bay, N. America, by the ſame mouth with Abbitibee river. Mooſe Fort, and a factory are ſituated at the mouth of this river, N. lat. 51 16, weſt long. 81 51; and Brunſwick Houſe is on its weſt bank about lat. 50 30. Round the bottom of James's Bay, from Albany Fort and river, on the weſt ſide, to Rupert's river on the eaſt ſide, the woods afford large timber trees of various kinds, as oak, aſh, beſides the pine, cedar, ſpruce, &c. Up Mooſe river beyond Brunſwick houſe is a fall of 50 feet, above which it is deep and navigable for a great diſtance; the ſoil and the climate above the fall are ſaid to be very good.—*Morſe.*

Moose *River*, a ſhort ſtream in Grafton county, New-Hampſhire, which runs north-eaſterly from the White Mountains into Amariſcoggin river.—*ib.*

MOOSEHEAD *Lake*, or *Mooſe Pond*, in Lincoln county, Diſtrict of Maine, is an irregular ſhaped body of water, which gives riſe to the eaſtern branch of Kennebec river, which unites with the other, above Norridgewock, about 20 miles ſouth of the lake. The lake is ſaid to be three times as large as Lake George. There are very high mountains to the north and weſt of the lake; and from theſe the waters run by many channels into the St Lawrence.—*ib.*

MOOSEHILLOCK, the higheſt of the chain of mountains in New-Hampſhire, the White Mountains excepted. It takes its name from its having been formerly a remarkable range for mooſe, and lies 70 miles weſt of the White Mountains. From its N. W. ſide proceeds Baker's river, a branch of Pemigewaſſet, which is the principal branch of Merrimack. On this mountain ſnow has been ſeen from the town of Newbury, Vermont, on the 30th of June and 31ſt of Auguſt; and on the mountains intervening, ſnow, it is ſaid, lies the whole year.—*ib.*

MOOSE *Iſland*, on the coaſt of the Diſtrict of Maine, at the mouth of Schoodick river, contains about 30 families. On the ſouth end of this iſland is an excellent harbour ſuitable for the conſtruction of dry docks. Common tides riſe here 25 feet.—*ib.*

MORANT *Keys*, off the iſland of Jamaica, in the Weſt-Indies. N. lat. 17 47, W. long. 75 35.—*ib.*

Morant *Point*, the moſt eaſterly promontory of the iſland of Jamaica. On the N. ſide of the point is a harbour of the ſame name. From Point Morant it is uſual for ſhips to take their departure that are bound through the Windward Paſſage, or to any part of the W. end of the iſland of St Domingo. N. lat. 17 58, W. long. 76 10.—*ib.*

Morant *Harbour, Port*, is about 4 leagues weſtward of Point Morant, on the ſouth coaſt of the iſland of Jamaica. Before the mouth of it is a ſmall iſland, called Good Iſland, and a fort on each point of the entrance.—*ib.*

Morant *River*, is 2 leagues weſtward of the weſt point of Point Morant. The land here forms a bay, with anchorage along the ſhore.—*ib.*

MORENA, a cape on the coaſt of Chili, S. America, is in lat. 23 45 S. and 15 leagues N. E. of Cape George. The bay between theſe capes ſeems very deſirable to ſtrangers to go in; but in a N. W. wind is very dangerous, becauſe the wind blows right on the ſhore, and makes a very heavy ſea in the road. Here is a very convenient harbour, but exceedingly narrow, where a good ſhip might be careened.—*ib.*

Morena Morro, on the coaſt of Chili, S. America, in lat. 23 S. and 20 leagues due S. of the north point of the bay of Atacama.—*ib.*

MORE, a townſhip in Northumberland county, Pennſylvania.—*ib.*

MORELAND, the name of two townſhips of Pennſylvania; the one in Philadelphia county, the other in that of Montgomery.—*ib*

MORGAN *Diſtrict*, in N. Carolina, is bounded W. by the State of Tenneſſee, and S. by the State of S. Carolina. It is divided into the counties of Burke, Wilkes, Rutherford, Lincoln, and Buncomb; and contains 33,292 inhabitants, including 2,693 ſlaves. —*ib.*

MORGANTOWN, a poſt-town and the chief town of the above diſtrict, is ſituated in Burke county near Catabaw river. Here are about 30 houſes, a court-houſe and gaol. It is 45 miles from Wilkes, 46 from Lincolntown, 113 from Salem, and 661 from Philadelphia. N. lat. 35 47.—*ib.*

Morgantown, a poſt-town of Virginia, and ſhire-town of Monongalia county, is pleaſantly ſituated on the eaſt ſide of Monongahela river, about 7 miles S. by W. of the mouth of Cheat river; and contains a court-houſe, a ſtone gaol, and about 40 houſes. It is 30 miles from Brownsville, 24 from Union-Town, in Pennſylvania, 76 from Cumberland in Maryland, and 329 from Philadelphia.—*ib.*

MORGANS, a ſettlement in Kentucky, 38 miles E. of Lexington, and 18 N. E. of Boonſborough.—*ib.*

MORGANZA, a town now laying out in Waſhington county, Pennſylvania, ſituated in, and almoſt ſurrounded by the E. and W. branches of Charter's river, including the point of their confluence; 13 miles S. of Pittſburg, and on the poſt-road from thence to Waſhington, the county town, diſtant 10 miles. Boats carrying from 2 to 300 barrels of flour, have been built at Morganza, laden at the mill tail there, and ſent down the Chartiers into the Ohio, and ſo to New-Orleans. By an act of the legiſlature of Pennſylvania, the *Chartiers*, from the Ohio upwards as far as Morganza, is declared to be a high-way. This town is ſurrounded by a rich country, where numbers of griſt and ſaw mills are already built; and the lands in its environs well adapted to agriculture and grazing; and is ſpoken of as a country that is or will be the richeſt in Pennſylvania. Morganza, from its ſituation and other natural advantages, muſt become the centre of a great manufacturing country; eſpecially as conſiderable bodies of iron ore, of a ſuperior quality, have been already diſcovered in the neighbourhood, and have been aſſayed. The high waving hills in this country are, from the quality of the ſoil, convertible into the moſt luxuriant grazing lands, and are already much improved in this way. Theſe hills will be peculiarly adapted to raiſe live ſtock, and more particularly the fine long-wooled breed of ſheep; ſuch as that of the Cotſwold hills in England, whoſe fleeces ſell for 2*ſ.* ſterling per pound; when others fetch only 12*d* or 15*d.* The wheat of this country is ſaid to weigh, generally, from 62 to 66lb. and the buſhel of 8 gallons. From hence, conſiderable exports are already made to New-Orleans, of flour, bacon, butter, cheeſe, cider, and rye and apple ſpirits. The black cattle raiſed here are ſold to the new ſettlers, and to cattle merchants, for the Philadelphia and Baltimore markets; many have alſo been driven to Niagara and Detroit, where there are frequent demands for live ſtock, which ſuffer much in thoſe northern countries, from hard winters, failure in crops, and other cauſes.—*ib.*

MORGUE *Fort*, or *Fortabeza dé Morgue*, on the ſouth ſhore of the entrance of Baldivia Bay, on the coaſt of Chili, on the South Pacific Ocean. The channel has from 9 to 6 fathoms.—*ib.*

MORIENNE, a bay on the E. coaſt of the iſland of Cape Breton, near Miray Bay from which it is ſeparated only by Cape Brule. It is a tolerably deep bay.—*ib.*

MORINDA, is a plant, of which a very meagre deſcription has been given in the *Encyclopædia*, though it is of much importance in oriental commerce. It is cultivated to a great extent in the province of *Maleva* in the Eaſt Indies, where it furniſhes a valuable dye-ſtuff; and is thus deſcribed by William Hunter, Eſq; in the fourth volume of the Aſiatic Reſearches:

" It is a tree of a middling ſize; the *root* branchy; the *trunk* columnar, erect, covered with a ſcabrous bark. *Branches*, from the upper part of the trunk, ſcattered; of the ſtructure of the trunk. *Leaves* (ſeminal) oval, obtuſe, entire (mature), oppoſite, decuſſated, ovate, pointed at both ends, ſmooth, with very ſhort petioles. *Stipules*, lanced, very ſmall, withering. *Peduncles*, from the axils of the leaves, ſolitary, bearing an aggregate flower. *Calyx*, common receptacle roundiſh, collecting the ſeſſile flowers into an irregular head. *Perianth*, moſt entire, ſcarce obſervable above. *Coral*, one petalled funnel-form. *Tube*, cylindric: *Border*, five cleft; the *diviſions* lanced. *Stamen: Filaments*, five thread-form, ariſing from the tube, and adhering to it through two-thirds of their length, a little ſhorter than the tube. *Anthers*, linear, erect. *Piſtil. Germ*, beneath, four-celled, containing the rudiments of four ſeeds. *Style*, thread-form longer than the ſtamens. *Stigma*, two cleft, thickiſh. *Pericarp*, common, irregular, divided on the ſurface into irregular angular ſpaces: compoſed of berries, pyramidal, compreſſed on all ſides by the adjacent ones, and concreted with them; lopped; containing towards the baſe a fleſhy pulp. *Seeds*, in each berry four; towards the point oblong, externally convex, internally angular."

The ſpecies here deſcribed is the *morinda arborea pedunculis ſolitariis* of Linnæus. It grows beſt in a black rich ſoil, free from ſtones, in ſituations moderately moiſt, not too high, yet ſufficiently elevated to prevent the rain water from ſtagnating, and where a ſupply of water can be had for the dry months. As the colouring matter, for which alone it is valuable, reſides chiefly in the bark of the root, the ſmall twigs, which contain little wood, bear a higher price than the larger pieces. The natives employ it in dyeing a pale red, or clay colour; which Mr Hunter ſays is more valuable for its durability than for its beauty. They likewiſe uſe it in dyeing a dark purple or chocolate colour: but for the proceſs, in both caſes, we muſt refer to the original memoir.

MORION, in botany, a name given by the ancients to a kind of nightſhade. See Solanum, *Encycl.*

Morion, in ancient mineralogy, a name given to one of the ſemipellucid gems, more commonly called *pramnion*. It is a ſtone appearing externally of a fine deep black; but when held up againſt a candle, or againſt the ſun-beams, it gives a very beautiful red in different degrees.

MORO *Caſtle* is on the point or headland on the E. ſide of the channel of the Havannah, in the N. W. part of the iſland of Cuba, and is the firſt of two ſtrong caſtles for the defence of the channel againſt the approach of an enemy's ſhips. It is a kind of triangle, fortified with baſtions, on which are mounted about 60 pieces of cannon, 24 pounders. From the caſtle there alſo runs a wall or line mounted with 12 long braſs cannon, 36 pounders; called, by way of eminence, "The twelve Apoſtles:" and at the point, between the caſtle and the ſea, there is a tower where a man ſtands and gives ſignals of what veſſels approach.—*Morse.*

MOROKINNEE, or *Morotinnee*, in the iſland of Mowee, one of the Sandwich Iſlands, in the N. Pacific Ocean, is in lat. 20 29 N. and long. 126 27 weſt. —*ib.*

MOROSQUILLO *Bay* is to the ſouthward of Carthagena, on the coaſt of the Spaniſh Main, and in the bight of the coaſt coming out of Darien Gulf, on the eaſtern ſhore.—*ib.*

MOROTOI, or *Morokoi*, one of the Sandwich Iſlands in the Pacific Ocean, is about 2½ leagues W. N. W. of Mowee Iſland, and has ſeveral bays on its S. and W. ſides. Its W. point is in lat. 21 20 N. and long. 157 14 W. and is computed to contain 36,000 inhabitants. It is 7 leagues S. E. of Woahoo Iſland.—*ib.*

MORRIS, a county on the northern line of New-Jerſey, weſt of Bergen county. It is about 25 miles long, and 20 broad, is divided into 5 townſhips, and contains about 156,809 acres of improved, and 30,429 acres of unimproved land. The eaſtern part of the county is level, and affords fine meadows, and good land for Indian corn. The weſtern part is more mountainous, and produces crops of wheat. Here are ſeven rich iron mines, and two ſprings famous for curing rheumatic and chronic diſorders. There are alſo 2 furnaces, two ſlitting and rolling-mills, 35 forges and fire-works, 37 ſaw-mills and 43 griſt-mills. There are in the county 16,216 inhabitants, of whom 636 are ſlaves.—*ib.*

MORRISSINA, a village in Weſt-Cheſter county, New-York, contiguous to Hell Gate, in the Sound. In 1790 it contained 133 inhabitants, of whom 30 were ſlaves. In 1791, it was annexed to the townſhip of Weſt Cheſter.—*ib.*

MORRISTOWN, a poſt-town and capital of the above county, is a handſome town, and contains a Preſbyterian and Baptiſt church, a court-houſe, an academy, and about 50 compact houſes; 19 miles N. W. of Newark, and about 100 N. E. of Philadelphia. The head-quarters of the American army, during the revolution war, was frequently in and about this town.—*ib.*

MORRISVILLE, a village in Pennſylvania, ſituated in Bucks county on the W. bank of Delaware river, one mile from Trenton, 9 from Briſtol, and 29 from Philadelphia. A poſt-office is kept here.—*ib.*

MORRIS *Bay*, on the W. coaſt of the iſland of Antigua, in the Weſt-Indies. It cannot be recommended to ſhips to paſs this way, as there is in one place S. from the Five Iſlands only 2 fathoms water. Veſſels drawing more than 9 feet water muſt not attempt it.—*ib.*

MORROPE, a town on the road between Quito and Lima, in S. America. It contains between 70 and 80 houſes, containing about 160 families, all Indians: near it runs the river Pozuelos, the banks of which are cultivated and adorned with trees. Morrope is 28 or 30 leagues diſtant from Sechura, all that way being a ſandy plain, the track continually ſhifting.—*ib.*

MORTIER's *Rocks*, on the S. coaſt of Newfoundland Iſland. N. lat. 47, W. long. 54 55.—*ib.*

MORTO *Iſland*, on the coaſt of Peru, ſo called by the Spaniards, from its ſtriking reſemblance to a dead corpſe, extended at full length. It is alſo called *St Clara*. It is about 5 leagues N. N. E. from the river Tumbez; and is 2 miles in length, and 27 leagues from Guayaquil.—*ib.*

MORTON *Bay*, on the N. W. coaſt of the iſland of Nevis, in the Weſt-Indies, is near the Narrows, or channel between that iſland and St Chriſtopher's, to the N. W. of which there is from 3 to 8 fathoms, according to the diſtance from ſhore.—*ib.*

MORUES *Bay*, on the ſouthern ſhore of the river St Lawrence, ſouthward of Gaſpee Bay, and weſt of Bonaventura and Miſcan iſlands.—*ib.*

MORUGO, a ſmall river to the weſt and northweſt of the gulf of Eſſequibo, on the coaſt of Surrinam, in S. America.—*ib.*

MOSE, or *Villa del Moſe*, a town on the bank of the river Tabaſco, in the bottom of Campeachy Gulf, to which ſmall barges may go up. Great quantities of cocoa are ſhipped here for Spain; which brings a great many ſloops and ſmall veſſels to the coaſt.—*ib.*

MOSES *Point*, a head or cape of land, on the E. ſide of the entrance into Bonaviſta Bay, on the E. coaſt of Newfoundland Iſland. It is to the ſouthward of the rocks called Sweers, and 5 miles ſouth-weſt of Cape Bonaviſta.—*ib.*

MOSHAIRA, or Moshahereh, penſion or allowance in Bengal.

MOSLEY's, a place on Roanoke river, 9 miles below St Tammany's, and 3 above Eaton's. The produce of the upper country is brought to theſe places, and ſent from thence by waggons to Peterſburg in Virginia.—*Morſe.*

MOSQUITO *Country*, a diſtrict of Mexico, having the North Sea on the N. and E. Nicaragua on the S. and Honduras on the W. The natives are tall, well made, ſtrong, and nimble of foot. They are implacable enemies to the Spaniards, who maſſacred a vaſt number of their people when they invaded Mexico, and will join with any European nation againſt the Spaniards. They are very dextrous in ſtriking fiſh, turtles and mannaties. Many of the natives ſail in Britiſh veſſels to Jamaica.—*ib.*

Mosquito *Bay*, or *Muſkito*, is at the S. E. extremity of the iſland of St Chriſtopher's, and on the larboard ſide of the channel of the Narrows, from the S. W. going round the point along the ſhore, within the reef to the northward. The coaſt is here lined with rocks, and at a ſmall diſtance is from 4 to 6 fathoms, on the W. N. W. ſide of Booby Iſland.—*ib.*

Mosquito, or *Muſquito Cove*, on the W. ſide of the iſland of Antigua, and ſouthward of Five Iſlands Harbour.—*ib.*

Mosquito *Iſland*, one of the ſmall Virgin Iſlands, in the Weſt-Indies, near the N. coaſt of Virgin Gorda, on which it is dependent. N. lat. 18 25, W. long. 63 15.—*ib.*

Mosquito *Point* is the larboard point of the channel into Port Royal Bay in Jamaica, where the powder magazines are ſituated, and on which is a battery of 80 guns, for the defence of the channel, which is here very narrow. Round the point to the north-weſterly, is a ſpacious bay or baſon, into which comes the river of Spaniſh Town.—*ib.*

Mosquito *Point*, at the entrance of the river Eſſequibo, on the coaſt of Dutch Guiana, S. America; round which, as ſoon as ſhips are within, they are directed to run S. E. and then due S. and come to an anchor before the firſt village.—*ib.*

MOSS, the name given in Scotland, and we believe alſo in ſome parts of England, to what is more properly called a *moraſs*, a *fen*, or a *bog*. On the formation of theſe moſſes ſome conjectures have been hazarded in the *Encyclopædia*, where the reader will likewiſe find a copious account of the method which has for many years been ſucceſsfully employed to convert the Moss of Kincardine into an arable ſoil, or rather to remove the ſubſtance called *moſs* or *peat* from the rich ſoil which is found below it. A method, however, has been invented by Mr John Smith of Swindrig-muir, in the ſhire of Ayr, for *actually* converting the ſubſtance called moſs into a vegetable mould, which has been found by experience to carry rich crops of corn, hay, potatoes, &c. Of this gentleman's practice we have the following account in a ſmall pamphlet publiſhed in Edinburgh, 1798, by Fairbairn and Dickſon.

“ The firſt thing to be done is to mark off, and cut out, proper main or maſter drains, in order to carry off the ſuperfluous water, taking care to preſerve the greateſt poſſible level; which drains are ſo conſtructed as to divide the field into incloſures from ſix to ten Scotch acres. If the moſs hangs or declines, the incloſures may be of any dimenſion whatever. The dimenſions of theſe drains when firſt made are eight feet wide, by four and a half feet deep, declining to two and a half feet at bottom, and coſt at the rate of one ſhilling per fall of eighteen and a half feet, running meaſure. The ridges are then to be marked off regularly, ſix or ſeven yards broad, formed with the ſpade in the manner following.

“ In the centre of each ridge, a ſpace of about 20 inches is allowed to remain untouched, on each ſide of which a furrow is opened, and turned upon the untouched ſpace, ſo as completely to cover it (like what is called the feering of a gathered ridge). Thus begun, the work is continued, by cutting with the ſpade, in width about 12 inches, and turning it over to appearance as if done with a plough, until you come to the diviſion furrow, which ſhould be two feet wide, cut out and thrown upon the ſides of the ridges. The depth of the diviſion furrow is to be regulated by circumſtances, according as the moſs is wet or dry, but ſo as to anſwer the purpoſe of as it were bleeding the moſs, and conducting the water to the main drains.

“ It may be here obſerved, that the ſucceſs of the aftercrops depends very much upon a proper formation of the ridges. They muſt not be made too high in the middle, for there they will be too dry like a peat, upon which the lime cannot act, and near the furrows they will be too wet, which is equally prejudicial; they ſhould therefore be conſtructed with a gentle declivity to the furrows, ſo as the rain which falls may rather filtrate through the ridge to the furrows than run quickly off the ſurface.

“ The next operation is to top-dreſs the ridges with lime, at the rate of from four to eight chalders per acre. Five Wincheſter buſhels make a boll, and eight bolls a chalder of ſhell lime, producing ſixteen bolls powdered lime. The quicker the lime is put on after being ſlacked the better.

“ The proper ſeaſon to prepare the moſs for a firſt crop is early the preceding ſummer; in that caſe the lime, aided by the heat, the after rains, and the winter froſts, makes conſiderable progreſs in the proceſs of putrefaction, conſequently forms a mould to receive the ſeed.

“ Though oats have ſometimes ſucceeded as a firſt crop, potatoes have been found greatly preferable. The method of planting them is ſimple, and attended with little expence. The moſs, prepared by ridges, and limed as before deſcribed, beds for the potatoes are, in the ſpring, marked off, acroſs the ridges, five or ſix feet broad, with intermediate ſpaces of about two feet, as furrows or trenches. The beds are covered over with a thin ſtratum of dung, about eighteen ſingle-horſe carts to an acre, the cuttings of the potatoes are laid or placed upon the beds, about ten or twelve inches aſunder, and the whole covered over with a thin ſtratum

tum of moſs from the intermediate trenches, which is followed by another covering from the trenches when the potatoe plants make their firſt appearance; the covering in whole four or five inches. In this ſtate they remain without any hoeing till the crop is taken up. The produce on Mr Smith's moſs has never been leſs than from forty to fifty bolls of excellent potatoes, eight Wincheſter buſhels to the boll, and the buſhel a little heaped.

"When the potatoe crop is removed, the ridges are again formed as before deſcribed, and the diviſion furrow cleared out. In performing this part of the work, it will naturally occur, that a great part of the manured ſurface will be buried in filling up the trenches between the potatoe beds: but that is not the caſe; the workman makes two cuts with the ſpade, at eighteen inches diſtance, upon the ſide of the trench; another, one foot from the edge of it, as deep as the trench; which, inſtead of turning over, he preſſes a foot forward into the trench, which is continued the length of it; and when he comes to the other ſide he does the ſame, making both meet, and ſo proceeds; ſo that no part of the manured ſurface is thrown down, and the ridge is left in the ſame form as before the lazy-beds* were made.

"When the potatoe crop is taken off, and the ridges formed as before deſcribed, they remain in that ſtate till ſpring, when oats are ſown (a wet or dry ſeaſon has from experience been found a matter of indifference), and harrowed in with a ſmall harrow drawn by two men. Four men with eaſe harrow at leaſt one acre one rood per day, two and two by turns with the harrow, and the other two in the interim with ſpades, ſmoothing the inequalities, breaking and dividing the mould, and clearing out the diviſion furrows; which laſt in all operations upon moſs are eſſentially neceſſary. The early or hot ſeed oats are always preferred for ſeed. The late or cold ſeed runs too much to ſtraw, falls down, and becomes ſloomy, conſequently the grain is of mean quality, and unproductive in meal.

"The produce of the firſt crop of oats after potatoes is ſeldom leſs than ten bolls per acre, the Linlithgow boll of ſix Wincheſter buſhels, and conſiderably more has been known; as good grain in quality, and meals as well as any in the country. It has been ſold when growing, what is called upon the foot, including the ſtraw, from eight to ten pounds per acre. To prepare for a ſecond crop of oats, the ridges muſt be dug acroſs, and turned over in the manner before deſcribed, and the diviſion furrows cleared out as ſoon as convenient after the firſt crop is removed.

"Such is the effect of lime in conſolidating moſs, aided by the draining, that often after the ſecond, and always after the third year, it can be ploughed by horſes within two bouts or ſtiches of the diviſion furrow; and alſo harrowed by horſes, and the crops taken off by carts.

"Five and often ſix conſecutive crops of oats are taken, without any other manure than what it received the firſt year for potatoes, without any apparent ſigns of it being exhauſted. The produce of the firſt two crops of oats has been mentioned to be ten bolls, and the third, fourth, fifth, and ſixth, produce from ſix to ten bolls per acre. The moſs is now turned into a ſeeming rich dark brown mould; and what renders it leſs productive of corn crops the fourth, fifth, and ſixth years is, its naturally running into ſweet and luxuriant graſſes. The ſoft meadow graſs, the daiſy, ſome plaintain, but principally the white clover, are the moſt prevalent graſſes; or more probably it may be aſcribed to theſe crops being ploughed, in place of being dug with the ſpade, as the former years were. Along with the fifth or ſixth crop of oats, rye-graſs is ſown, which, with the natural graſſes in general, produce an abundant crop of hay.

"If the moſs in the original ſtate has been wet and ſpongy, it will be found to have ſubſided ſome feet after the third or fourth year's operation has been performed; but care muſt always be taken to deepen, clear out, and keep clear the main drains and the diviſion furrows, to prevent a ſuperabundance of moiſture, which would infallibly be the caſe were they neglected in conſequence of the ſubſidence of the moſs. Indeed moſs of all ſorts will ſubſide leſs or more, in proportion as it has been dry or wet in its original ſtate; at the ſame time, as ſtated before, care muſt be taken not to lay it too dry, but to keep in a proper degree of temperature between theſe two extremes."

By having recourſe to the pamphlet from which this extract has been made, the reader may ſatisfy himſelf of the real advantages of this ſpecies of agriculture. The author calculates, with much apparent fairneſs, the expence of improvement, and the value of each crop, and concludes that no waſte can be improved with equal advantage as moſs. It muſt not, however, be concealed, that we have heard practical farmers, who ſeemed to be acquainted with the ſubject, give it as their opinion that this mode of cultivation anſwers only in moſſes of no great depth; though our author affirms that it has with great ſucceſs been practiſed by Mr Smith in moſſes of the depth of 14 feet.

MOTION in fluids. When in the publication of this *Supplement* we had arrived at the title Fluids, we were ſtruck with the importance given, in ſome of the journals, to *The Experimental Reſearches of* Venturi *concerning the Principle of the lateral communication of Motion in Fluids applied to the Explanation of various Hydraulic Phenomena*. Of theſe reſearches we intended to lay an abridged account before our readers under the preſent title; but having examined the work with ſome attention, we find in it hardly any thing of conſequence which the mechanical philoſopher may not learn from our articles *Resistance of Fluids* and River in the *Encyclopædia*. That our readers, however, may find ſomething under a title to which we raſhly referred them, we ſhall, in the words of Nicholſon's Journal of Natural Philoſophy, &c. inform them what Venturi's work contains.

"This author, who is profeſſor of experimental philoſophy at Modena, has introduced an horizontal current of water into a veſſel filled with the ſame fluid at reſt. This ſtream entering the veſſel with a certain velocity, paſſes through a portion of the fluid, and is then received in an inclined channel, the bottom of which gradually riſes until it paſſes over the border or rim of the veſſel itſelf. The effect is found to be, not only that the ſtream itſelf paſſes out of the veſſel through the channel, but carries along with it the fluid contained in the veſſel; ſo that after a ſhort time no more of the fluid remains than was originally below the aperture at which the ſtream enters. This fact is adopted as a

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* This is a vulgar Scottiſh phraſe for beds of a particular kind of potatoe.

principle or primitive phenomenon by the author, under the denomination of the lateral communication of motion in fluids, and to this he refers many important hydraulic facts. He does not undertake to give an explanation of this principle, but ſhows that the mutual attraction of the particles of water is far from being a ſufficient cauſe to account for it.

The firſt phenomenon which the author propoſes to explain by this eſtabliſhed principle, is the emiſſion of a fluid through different adjutages applied to the reſervoir which contains it. It is known that the vein of fluid which iſſues from an orifice or perforation through a thin plate, becomes contracted, ſo as to exhibit a ſection equal to about 0,64 of the orifice itſelf, ſuppoſed to be circular; and that the place of the greateſt contraction is uſually at the diſtance of one ſemi-diameter of the orifice itſelf. If a ſmall adjutage be adapted to the orifice, having its internal cavity of the ſame conoidal form as the fluid itſelf affects in that interval, the expenditure is the ſame as by the ſimple orifice. But if at the extremity of this adjutage a cylindric tube be affixed, of a greater diameter than that of the contracted vein, or a divergent conical tube, the expence of fluid increaſes, and may exceed the double of that which paſſes through the aperture in the thin plate, though the adjutage poſſeſs an horizontal or even aſcending direction.

By the interpoſition of a ſmall adjutage, adapted to the form of the contracted vein, Venturi aſcertained, in the firſt place, that there is an increaſe of velocity in the tubes he employed, though the velocity of emiſſion itſelf be leſs than that of the ſtream which iſſues from a hole in a thin plate. He afterwards proves, by the fact, that the interior velocity and expenditure of fluid, which is increaſed through tubes, even in the horizontal or aſcending direction, is owing to the preſſure of the atmoſphere. If the ſmalleſt hole be made in the ſide of the tube near the place of contraction of the vein, the increaſed expenditure does not take place; and when a vertical tube is inſerted in ſuch a hole, the lower end of which tube is immerſed in water or mercury, it is found that aſpiration takes place, and the water or mercury riſes; and this aſpiration in conical tubes is leſs in proportion, as the place of inſertion of the upright tube is more remote from the ſection where the greateſt contraction would have taken place. And, laſtly, the difference between the expenditure of fluid, through an orifice made in a thin plate, and that which is obſerved through an additional tube, does not take place in vacuo.

The influence of the weight of the atmoſphere on the horizontal or aſcending flux being thus eſtabliſhed, the author conſiders it as a ſecondary cauſe, referable to, and explicable by, his principle of the lateral communication of motion in fluids. In conical divergent tubes, for example, the effect of this lateral communication is, that the central cylindrical jet, having for its baſis the ſection of the contracted vein, carries with it the lateral fluid which would have remained ſtagnant in the enlarged part of the cone. Hence a vacuum tends to be produced in this enlarged part which ſurrounds the central cylindric ſtream; the preſſure of the atmoſphere becomes active to ſupply the void, and is exerted on the ſurface of the reſervoir, ſo as to increaſe the velocity of the fluid at the interior extremity of the tube.

The author proves, that the velocity or total expenditure of fluid through an aperture of given dimenſions, may be increaſed by a proper adjutage in the proportion of 24 to 10: he applies this reſult to the conſtruction of the funnels of chimneys. He determines the loſs of emitted fluid, which may be ſuſtained by ſinuoſity in pipes. He ſhews by experiment, that a pipe which is enlarged in any part affords a much leſs quantity of fluid than if it were throughout of a diameter equal to that of its ſmalleſt ſection. This, as he remarks, is a circumſtance to which ſufficient attention has not been paid in the conſtruction of hydraulic machines. It is not enough to avoid elbows and contractions; for it ſometimes happens that, by an intermediate enlargement, the whole of the advantage ariſing from other judicious diſpoſitions of the parts of the machine is loſt.

There are two cauſes of the increaſe of expenditure through deſcending pipes. The firſt is owing to the lateral communication of motion which takes place in deſcending pipes, in the ſame manner as in thoſe which poſſeſs an horizontal ſituation; the ſecond ariſes from the acceleration by gravity which takes place in the fluid while it falls through the deſcending tube. This ſecond kind of augmentation was known to the ancients, though they poſſeſſed no good theory nor deciſive experiments reſpecting it. The author endeavours to eſtabliſh a theory on the principle of virtual aſcenſion combined with the preſſure of the atmoſphere. His deductions are confirmed by experiment, in which he has ſucceeded ſo far as to ſeparate the two cauſes of augmentation, and aſſigned to each their reſpective degree of influence.

Profeſſor Venturi then proceeds to different objects of enquiry, to which his principle ſeemed applicable. He gives the theory of the water blowing machine (ſee *WATER Blowing Machine* in this *Suppl.)*, and he determines by calculation the quantity of air which one of theſe machines can afford in a given time. He obſerves, that the natural falls of water in the mountains always produce a local wind; and he even thinks, that the falling ſtreams in the internal parts of mountains are in ſome inſtances the cauſe of the winds which iſſue from caves. He proves, by the facts, that it is poſſible, in certain inſtances, to carry off, without any machinery, the waters from a ſpot of ground, though it may be ſituated on a lower level than that of the channel which is to receive the water.

The whirlpools, or circular eddies of water ſo frequent in rivers, are, according to the theory of our author, the effect of motion communicated from the parts of the current which are moſt rapid, to thoſe lateral parts which are leaſt ſo. In the application of this principle, he points out the circumſtances adapted to produce ſuch eddies at the ſurface or at the bottom of rivers. He concludes, that every movement of this kind deſtroys a part of the force of the current, and that in a channel through which water conſtantly flows, the height of this fluid will be greater than it would have been if the dimenſions of the channel had been uniformly reduced to the meaſure of its ſmalleſt ſection.

There is another kind of whirling motion ſomewhat different in its nature from theſe laſt. It is produced in the water of a reſervoir, when it is ſuffered to flow through an horizontal orifice. The author deduces the theory of theſe vortices from the doctrine of central forces. The form of the hollow funnel, which in this caſe opens through the fluid of the reſervoir, is a curve of the 64th ſpecies of the lines of the third order, enumerated by Newton. Theory and experiment both unite here in proving, that it is not only poſſible, but that there really exiſts in nature a vortex, the concavity of which is convex towards the axis, and of which the revolutions of its different parts follow the ratio of the ſquare of the diſtance from the centre. Daniel Bernoulli was in the wrong, in his Hydrodynamics, to reproach Newton for having ſuppoſed a vortex to be moved according to this law.

In the laſt place, the author conſiders that lateral communication of motion which takes place in the air as well as in the water. This is the cauſe of ſuch local and partial winds as ſometimes blow contrary to the direction of the general wind. It is by virtue of the ſame principle, that the reſonant vibration, excited laterally in the extremity of an organ pipe, is communicated to the whole column of air contained in the pipe itſelf.

From the ſame principle, the author deduces the augmentation of force which ſound receives in conical divergent tubes, compared with thoſe of a cylindrical form. On this occaſion, he points out the remarkable differences which appear to take place between the reſonant vibrations of air contained in a tube, and the ſonorous pulſations propagated through the open atmoſphere. See *Speaking Trumpet*, Encycl.

In an appendix, Venturi relates different experiments which he has made to determine the convergence and velocity of the fluid filaments which preſs forward to iſſue out of a reſervoir by an orifice through a thin plate. He proves, by a very clear experiment, that the contraction of the vein is made at a greater diſtance from the orifice under ſtrong than under weak preſſures. He explains why, in a right-lined orifice, the ſides of the contracted vein correſpond with the angles of the orifice and the angles with the ſides. He examines the expenditure through a tube, the extremity of which is thruſt into the reſervoir itſelf, according to the method of Borda in the Memoirs of the Academy of Sciences for the year 1766."

For a full account of the author's experiments, and his deductions from them, we refer the reader either to the original work, intitled, *Recherches expérimentales ſur le Principe de la Communication latérale du Mouvement dans les Fluides, appliqué à l'Explication de différens Phenomènes hydrauliques. Par le Citoyen J. B. Venturi, Profeſſeur de Phyſique expérimentale à Modène, Membre de la Societé Italienne, &c. &c. A Paris chez Houel et Ducros, Rue du Bacq,* N° 940—*Theophile Barrois, Rue Haute-feuille,* N° 22. *Ann.* VI. 1797—or to the 2d and 3d vols of the valuable Journal from which this abſtract is taken.

MOTTE *Iſle*, a ſmall iſland in Lake Champlain, about 8 miles in length and 2 in breadth diſtant 2 miles W. of North Hero Iſland. It conſtitutes a townſhip of its own name in Franklin county, Vermont, and contains 47 inhabitants.—*Morſe.*

MOUCHA, *La*, a bay on the coaſt of Chili, on the W. coaſt of S. America.—*ib.*

MOULTONBOROUGH, a poſt-town in Strafford county, New-Hampſhire, ſituated at the N. W. corner of Lake Winnipiſeogee, 18 miles E. by N. of Plymouth, and 48 N. W. by N. of Portſmouth. This townſhip was incorporated in 1777, and contains 565 inhabitants.—*ib.*

MOUNT BETHEL, *Upper* and *Lower*, two townſhips in Northampton county, Pennſylvania.—*ib.*

MOUNT DESERT, an iſland on the coaſt of Hancock county, Diſtrict of Maine, about 15 miles long and 12 broad. It is a valuable tract of land, interſected in the middle by the waters flowing into the S. ſide from the ſea. There are two conſiderable iſlands on the ſouth-eaſt ſide of Mount Deſert Iſland, called Cranberry Iſlands, which aſſiſt in forming a harbour in the gulf which ſets up on the ſouth ſide of the iſland. In 1790, it contained 744 inhabitants. The northerly part of the iſland was formed into a townſhip called Eden, in 1796. The ſouth-eaſternmoſt part of the iſland lies in about lat. 44 12 N. On the main land, oppoſite the north part of the iſland, are the towns of Trenton and Sullivan. It is 335 miles north-eaſt of Boſton.—*ib.*

MOUNT HOLLY, a village in Burlington county, New-Jerſey, ſituated on the northern bank of Ancocus Creek, about 7 or 8 miles ſouth-eaſt of Burlington.—*ib.*

MOUNT HOPE *Bay*, in the northeaſt part of Narraganſet Bay.—*ib.*

Mount Hope, a ſmall river of Connecticut, a head branch of the Shetucket, riſing in Union.—*ib.*

MOUNT JOY, the name of two townſhips in Pennſylvania, the one in Lancaſter the other in York county.—*ib.*

Mount Joy, a Moravian ſettlement in Pennſylvania, 16 miles from Litiz.—*ib.*

MOUNT PLEASANT, a townſhip in Weſt-Cheſter county, New-York, ſituated on the eaſt ſide of Hudſon river; bounded ſoutherly by Greenſburg, and northerly and eaſterly by Philipſburg. It contains 1,924 inhabitants, of whom 275 are qualified electors, and 84 ſlaves. Alſo the name of a townſhip in York county, Pennſylvania.—*ib.*

Mount Pleasant, a village of Maryland, ſituated partly in each of the counties of Queen Ann and Caroline, about 11 miles eaſt of the town of Church Hill.—*ib.*

MOUNT TOM, a noted mountain on the weſt bank of Connecticut river, near Northampton. Alſo the name of a mountain between Litchfield and Waſhington, in Connecticut.—*ib.*

MOUNT VERNON, the ſeat of George Washington, late Preſident of the United States. It is pleaſantly ſituated on the Virginia bank of Patowmac river, in Fairfax county, Virginia, where the river is nearly 2 miles wide; 9 miles below Alexandria; 4 above the beautiful ſeat of the late Col. Fairfax, called Bellevoir; 127 from Point Look Out, at the mouth of the river, and 280 miles from the ſea. The area of the mount is 200 feet above the ſurface of the river; and, after furniſhing a lawn of five acres in front, and about the ſame in rear of the buildings, falls off rather abruptly on thoſe two quarters. On the north end it ſubſides gradually into extenſive paſture grounds; while on the ſouth it ſlopes more ſteeply, in a ſhort diſtance, and terminates with the coach-houſe, ſtables, vineyard, and nurſeries. On either wing is a thick grove of different flowering foreſt trees. Parallel with them, on the land ſide, are two ſpacious gardens, into which one is led by two ſerpentine gravel walks, planted with weeping willows and ſhady ſhrubs. The manſion houſe itſelf appears venerable and convenient. The ſuperb banqueting-room has been finiſhed ſince the General returned home from the army. A lofty portico, 96 feet in length, ſupported by 8 pillars, has a pleaſing effect when viewed from the water; the whole aſſemblage of the green-houſe, ſchool-houſe, offices, and ſervants' halls, when ſeen from the land ſide, bears a reſemblance to a rural village; eſpecially as the lands on that ſide are laid out ſomewhat in the form of Engliſh gardens, in meadows and graſs-grounds, ornamented with little copſes, circular clumps, and ſingle trees. A ſmall park on the margin of the river, where the Engliſh fallow deer and the American wild deer are ſeen through the thickets, alternately with the veſſels as they are ſailing along, add a romantic and pictureſque appearance to the whole ſcenery. On the oppoſite ſide of a ſmall creek to the northward, an extenſive plain, exhibiting corn-fields and cattle grazing, affords in ſummer a luxuriant landſcape; while the blended verdure of wood-lands and cultivated declivities, on the Maryland ſhore, variegates the proſpect in a charming manner. Such are the philoſophic ſhades to which the Commander in chief of the American army retired in 1783, at the cloſe of a victorious war; which he again left in 1789, to dignify with his unequalled talents, the higheſt office in the gift of his fellow-citizens; and to which he again retreated in 1797 loaded with honours, and the benedictions of his country, to ſpend the remainder of his days as a private citizen, in peace and tranquillity.—*ib.*

Mount Vernon, a plantation in Lincoln county, Diſtrict of Maine, in the neighbourhood of Sidney and Winſlow.—*ib.*

MOUNT WASHINGTON, in the upper part of the iſland of New-York.—*ib.*

Mount Washington, one of the higheſt peaks of the White Mountains, in New-Hampſhire.—*ib.*

Mount Washington, the ſouth-weſternmoſt townſhip of Maſſachuſetts, in Berkſhire county, 150 miles W. by S. of Boſton. It was incorporated in 1779, and contains 67 inhabitants.—*ib.*

MOURZOUK, the capital of Fezzan in Africa, is ſituated on a ſmall river, and ſupplied with water from a multitude of ſprings and wells. Being formerly built of ſtone, it ſtill retains the appellation of a Chriſtian town; and the medley which it preſents to the eye, of the vaſt ruins of ancient buildings, and the humble cottages of earth and ſand that form the dwelling of its preſent Arab inhabitants, is ſingularly grotеſque and ſtrange. It is ſurrounded by a high wall, which not only affords the means of defence, but enables the government to collect, at its three gates, a tax on all goods (proviſions excepted) that are brought for the ſupply of its people. A caravan ſets out annually from Meſurata to this place; and hence the Fezzaners themſelves diſpatch every year a caravan to Caſhna and another to Bornou. For the latitude of Mourzouk, ſee Fezzan in this *Suppl.* Dr Brookes, in his Gazetteer, places it in 15° 5′ E. Long.

MOUSE *Harbour*, at the E. ſide of the iſland of St John's, and at the S. W. angle of the gulf of St Lawrence, is between Eaſt Point and Three rivers, and goes in with a ſmall creek that is moderately ſpacious within.—*Morse.*

MOUSOM, a ſmall river of York county, Diſtrict of Maine, which falls into the ocean between Wells and Arundel.—*ib.*

MOWAZZEF, in Bengal, fixed revenue.

MOWEE, one of the Sandwich Iſles, next in ſize to, and N. W. of, Owhyhee. A large bay of a ſemicircular form; oppoſite to which are the iſlands Tahoorowa and Morokinnee. It is about 162 miles in circumference, and is thought to contain nearly 70,000 inhabitants.—*Morse.*

MOYAMENSING, a townſhip in Philadelphia county, Pennſylvania.—*ib.*

MOZART, the celebrated German muſician, was born at Salzburg in the year 1756. His father was alſo a muſician of ſome eminence, but not to be compared with the ſon; of whom we have the following account in one of the monthly miſcellanies, taken by Mr Buſhby from ſome biographical ſketches by two eminent German profeſſors.

At the age of three years, young Mozart, attending to the leſſons which his ſiſter, then ſeven years old, was receiving at the harpſichord, he became captivated with harmony; and when ſhe had left the inſtrument, he would inſtantly place himſelf at it, find the thirds, ſound them with the livelieſt joy, and employ whole hours at the exerciſe. His father, urged by ſuch early and ſtriking indications of genius, immediately began to teach him ſome little airs; and ſoon perceived that his pupil improved even beyond the hopes he had formed of him. Half an hour was generally ſufficient for his acquiring a minuet or a little ſong, which, when once learned, he would of himſelf perform with taſte and expreſſion.

At the age of ſix years he had made ſuch a progreſs as to be able to compoſe ſhort pieces for the harpſichord, which his father was obliged to commit to paper for him. From that time nothing made any impreſſion upon him but harmony; and infantine amuſements loſt all their attractions unleſs muſic had a ſhare in them. He advanced from day to day, not by ordinary and inſenſible degrees, but with a rapidity which hourly excited new ſurpriſe in his parents—the happy witneſſes of his progreſs.

His father returning home one day with a ſtranger, found little Mozart with a pen in his hand. "What are you writing," ſaid he? "A concerto for the harpſichord," replied the child. "Let us ſee it (rejoined the father); it is a marvellous concerto without doubt." He then took the paper, and ſaw nothing at firſt but a maſs of notes mingled with blots of ink by the mal-addreſs of the young compoſer, who, unſkilled in the management of the pen, had dipped it too freely in the ink; and having blotted and ſmeared his paper, had endeavoured to make out his ideas with his fingers; but on a cloſer examination, his father was loſt in wonder; and his eyes delighted and flowing with tears, became rivetted to the notes. "See (exclaimed he to the ſtranger) how juſt and regular it all is! but it is impoſſible to play it; it is too difficult." "It is a concerto (ſaid the child), and muſt be practiſed till one can play it. Hear how this part goes." He then ſat down to perform it; but was not able to execute the paſſages with ſufficient fluency to do juſtice to his own ideas. Extraordinary as his manual facility was univerſally allowed to be for his age, it did not keep pace with the progreſs of his knowledge and invention. Such an inſtance of intellectual advancement, in a child only ſix years of age, is ſo far out of the common road of nature, that we can only contemplate the fact with aſtoniſhment, and acknowledge, that the poſſible rapidity of mental maturation is not to be calculated.

In the year 1762, his father took him and his ſiſter to Munich, where he performed a concerto before the elector, which excited the admiration of the whole court; nor was he leſs applauded at Vienna, where the emperor called him the *little ſorcerer*.

His father gave him leſſons only on the harpſichord; but he privately taught himſelf the violin; and his command of the inſtrument afforded the elder Mozart the utmoſt ſurpriſe, when he one day at a concert took a ſecond violin, and acquitted himſelf with more than paſſable addreſs. True genius ſees no obſtacles. It will not therefore excite our wonder, if his conſtant ſucceſs in whatever he attempted begot an unbounded confidence in his own powers; he had even the *laudable* hardihood to undertake to qualify himſelf for the *firſt* violin, and did not long remain ſhort of the neceſſary proficiency.

He had an ear ſo correct, that he felt the moſt minute diſcordancy; and ſuch a fondneſs for ſtudy, that it was frequently neceſſary to take him by force from the inſtrument. This love of application never diminiſhed. He every day paſſed a conſiderable time at his harpſichord, and generally practiſed till a late hour at night. Another characteriſtical trait of real genius; always full of its object, and loſt as it were in itſelf.

In the year 1763 he made, with his father and ſiſter, his firſt grand muſical journey. He viſited Paris; and was heard by the French court in the chapel-royal at Verſailles, where his talent on the organ was admired even more than on the harpſichord. At Paris the muſical travellers gave two concerts, which procured them the higheſt reputation, and the diſtinction of public portraits. It was here that a ſet of ſonatas for the harpſichord, ſome of his earlieſt compoſitions, were engraved and publiſhed.

From Paris they went to London, where they alſo gave two concerts, conſiſting of ſymphonies compoſed by young Mozart, who even at that early age ſang alſo with much expreſſion, and practiſed publicly with his ſiſter. Mozart played already at ſight, and in a concert, at which the king was one of his auditors, a baſs being placed before him as a *ground*, immediately applied to it a moſt beautiful melody. Thoſe who are beſt acquainted with the extent of ſuch a taſk, will be the moſt aſtoniſhed at ſuch mature familiarity with the intricacies of the ſcience, and ſuch prompt and ready invention in ſo juvenile a mind.

From London, where Mozart alſo publiſhed ſix ſonatas for the harpſichord, the muſical family went to Holland, thence again to France, and in 1766 returned to Salzburg. There this extraordinary youth remained more than a year in perfect repoſe; devoting the whole of his time to the ſtudy of compoſition, the principles of which he ſcrutinized with the depth and penetration of confirmed manhood. Emmanuel Bach, Haſſe, and Handel, were his chief guides and models; though he by no means neglected the old Italian maſters.

In 1768 he again viſited Vienna, where Joſeph II. engaged him to ſet to muſic a comic opera, entitled, *La Finta Semplice*, which obtained the approbation of Haſſe and Metataſio. At the houſe of the prince of Kaunitz, it often happened that the firſt Italian air which came to hand would be given him, that in the preſence of the company he might add to it accompaniments for numerous inſtruments; which he would write in the firſt ſtyle of excellence, and without the leaſt premeditation. This is at once a proof with what acuteneſs of obſervation he had liſtened to the muſic of the beſt maſters; how intimate he had already rendered himſelf with the characters, capacities, and effects of the different inſtruments; and what ſkill he had acquired in that abſtruſe art of mixed combination which, while it calculates the conjoint effect of ſounds, as they regard the eſtabliſhed laws of harmony, accommodates the different parts to the ſcales, tones, and powers of the reſpective inſtruments by which they are to be executed. It was at this time alſo that, although but twelve years of age, he compoſed the muſic for the conſecration of the church of orphans, at the performance of which he himſelf preſided.

In 1769 Mozart again returned to Salzburg, where he became *maitre de concert*. Not having yet ſeen Italy, in December of the ſame year he ſet out for that ſeat of the fine arts. Thoſe talents which had already excited the admiration of Germany, France, and England, now awakened in that land of muſical taſte the moſt lively enthuſiaſm.

In 1771 he had no ſooner given perſonal proofs of his genius, than *la ſcrittura* for the following carnival was conferred upon him. He viſited Bologna, then as famous for harmonic excellence as Naples, where the celebrated theoriſt Martini was amazed to ſee a German boy work and execute the theme of a fugue which he preſented to him, in the extraordinary ſtyle in which Mozart acquitted himſelf. He next went to Florence. Florence even enhanced the eulogiums which Bologna had laviſhed upon him.

During the holy week he arrived at Rome, and aſſiſted at the *Miſerere* in the Sixtine chapel; which performance is juſtly conſidered as the *ne plus ultra* of vocal muſic. This circumſtance claims particular notice, as inducing a proof of another faculty of his mind, only to be equalled by thoſe wonderful powers which he had already demonſtrated. He was prohibited from taking a copy of this *Miſerere*, and therefore piqued himſelf on retaining it in his memory. Having heard it with attention, he went home, made out a manuſcript from recollection, returned the next day to the chapel, heard the piece a ſecond time, corrected the rough draught, and produced a tranſcript which ſurpriſed all Rome. This *Miſerere* formed a *ſcorer* numerous in its parts, and extremely difficult of execution. His mind had embraced and retained the whole!

He ſoon after received from the Pope the order of the gilt ſpur; and at Bologna was complimented, by an unanimous deciſion, with the title of *Member and Maſter of the Phil-harmonic Academy*. As a proof, *pro-forma*, of his qualifications for this academical honour, a fugue, for four voices, in the church ſtyle, was required of him, and he was ſhut up alone in his chamber. He completed it in half an hour, and received his diploma. This evinced that he poſſeſſed an imagination conſtantly at his command, and that his mind was ſtored with all the riches of his beloved ſcience.

The opera which he compoſed for Milan was called *Mithridates*. This piece procured him *la ſcrittura* for the grand opera of the carnival of 1773, which was his *Lucio Sulla*. At length, after a tour of fifteen months, he returned to Salzburg.

In 1771 Mozart viſited Paris; but not reliſhing the muſic of that capital, he ſoon quitted it, and returned to his domeſtic comforts. In 1781, at the requeſt of the elector of Bavaria, he compoſed the opera of *Idomeneo* for the carnival of that year. The general merit of this opera is ſo great, that it might ſerve alone for the baſis of a diſtinguiſhed reputation. At his twenty-fifth year he was invited to Vienna, where he continued ſpreading, as from a centre, the taſte of his compoſitions through all Germany, and the luſtre of his name over the whole of Europe.

Of all the virtuoſi of the piano forte who then crowded Vienna, Mozart was much the moſt ſkilful. His finger was extraordinarily rapid and taſteful, and the execution of his left hand exceeded every thing that had before been heard. His touch was replete with delicacy and expreſſion; and the profound ſtudy he had beſtowed on his art, gave his performance a ſtyle the moſt brilliant and finiſhed. His compoſitions had a rapid circulation; and in every new piece the connoiſſeurs were ſtruck with the originality of its caſt, the novelty of the paſſages, and the energy of the effect.

Joſeph II. ſolicitous for the perfection of the German opera, engaged Mozart to compoſe a piece. He accordingly produced *L'enlevement du Serail;* performed for the firſt time in 1782. It excited the jealouſy of the Italian company, who therefore ventured to cabal againſt it. The emperor, addreſſing himſelf to the compoſer, ſaid, "It is *too fine* for our ears, my dear Mozart, and moſt *charmingly crowded* with notes." "Preciſely what it ought to be," replied the ſpirited muſician, who juſtly ſuſpected that this remark had been ſuggeſted to Joſeph by the envious Italians. "Though I cannot deſcribe, as an auricular evidence, (ſays the faithful author of the biography), the applauſes and the admiration which this opera produced at Vienna, yet I have witneſſed the enthuſiaſm it excited at Prague among all the connoiſſeurs, as well as among thoſe whoſe ears were leſs cultivated. It was ſaid, that all which had been heard before was not muſic: it drew the moſt overflowing audiences: every body was amazed at its new traits of harmony, and at paſſages ſo original, and till then ſo unheard from wind inſtruments."

The cautious reader will perhaps heſitate to admit, in its fulleſt extent, this account by the author of the biography; but even after an allowance for ſome exaggeration, the moſt phlegmatic will grant that much muſt have been atchieved by this great maſter, to afford a baſis for ſo glowing a picture of the merit and ſucceſs of *L'enlevement du Serail.* During the compoſition of this opera, he married Mademoiſelle Weber, a diſtinguiſhed virtuoſa; and the piece was ſuppoſed to owe to this felicitous circumſtance much of that endearing character, that tone of tenderneſs, and that expreſſion of the ſofter paſſions, which form its principal attractions.

"The Marriage of Figaro," which was in the higheſt repute at all the theatres, was in the year 1787 transformed into an Italian opera; and Mozart, at the inſtance of the emperor, ſet it to muſic. This piece was highly received everywhere, and kept poſſeſſion of the theatre at Prague during almoſt the whole of the winter in which it firſt appeared: numerous extracts were made from it, and the ſongs and dances of Figaro were vociferated in the ſtreets, the gardens, and the taverns. Mozart came that very winter to Prague, and performed in public on the piano forte. His auditors at all times liſtened to him with admiration; but whenever he played extempore, and indulged the ſpontaneous and uninterrupted ſallies of his fancy, which he ſometimes would for more than half an hour, every one was ſeized with the moſt enthuſiaſtic raptures, and acknowledged the unrivalled reſources of his imagination. About this time the manager of the theatre contracted with him for the compoſition of a new opera, which, when produced, was called *Il diſſoluto Punito,* or *Don Giovanni.* His reputation was now ſo exalted, that the Bohemians piqued themſelves on the circumſtance that this opera was compoſed for their entertainment.

But this fame, this great and univerſal applauſe, had not yet produced to the admired artiſt any ſolid advantages; he had obtained no place, no ſettled income; but ſubſiſted by his operas, and the inſtructions and occaſional concerts which he gave. The profits of theſe proved inſufficient for the ſtyle which he was obliged to ſupport; and his finances became much deranged. The critical ſituation in which he now found himſelf, made him reſolve to quit Vienna, and ſeek an aſylum in London; to which metropolis he had often been invited; but Joſeph nominating him *compoſiteur de la chambre,* though, with a very inadequate ſalary, he was induced to accept it; and Germany had the advantage of retaining him.

It is lamentable that premature genius too rarely enjoys a long career: The acceleration of nature in the mental powers ſeems to hurry the progreſs of the animal œconomy, and to anticipate the regular cloſe of temporal exiſtence.

In the year 1791, Mozart, juſt after he had received the appointment of *Maitre de chapelle* of the church of St Peter, and when he was only thirty-five years of age, paid the laſt tribute; and left the world at once to admire the brilliancy, and lament the ſhortneſs of his earthly ſojournment.

Indefatigable, even to his death, he produced, during the laſt few months of his life, his three great maſter pieces *La Flutte Enchantée, La Clemence de Titus,* and a *Requiem,* his laſt production. *La Flutte Enchantée* was compoſed for one of the theatres at Vienna; and no dramatic *Olio* could ever boaſt a greater ſucceſs. Every air ſtruck the audience with a new and ſweet ſurpriſe; and the *tout enſemble* was calculated to afford the deepeſt and moſt varied impreſſions. This piece had, in fact, ſo great a number of ſucceſſive repreſentations, that for a long time it was unneceſſary to conſult the opera-bill; which only announced a permanent novelty. And the airs ſelected from it, and repeated throughout the empire, as well in the cottage as in the palace, and which the echoes have reſounded in the moſt diſtant provinces, favoured the idea that Mozart had actually the deſign to enchant all Germany with his *Flutte Enchantée.*

La Clemence de Titus was requeſted by the ſtates of Bohemia for the coronation of Leopold. The compoſer began it in his carriage during his route to Prague, and finiſhed it in eighteen days.

Some circumſtances attending the compoſition of the piece which we have already mentioned as the laſt effort of his genius, are too intereſting to be omitted. A ſhort time before his death, a ſtranger came to him with the requeſt that he would compoſe, as ſpeedily as poſſible, a *requiem* for a catholic prince, who, perceiving himſelf on the verge of the grave, wiſhed, by the execution of ſuch a piece, to ſoothe his mind, and familiariſe it to the idea of his approaching diſſolution. Mozart undertook the work; and the ſtranger depoſited with him as a ſecurity 400 ducats, though the ſum demanded was only 200. The compoſer immediately began the work, and during its progreſs felt his mind unuſually raiſed and agitated. He became at length ſo infatuated with his *requiem*, that he employed not only the day, but ſome hours of the night in its compoſition. One day, while he was converſing with Madame Mozart on the ſubject, he declared to her that he could not but be perſuaded that it was for himſelf he was writing this piece. His wife, diſtreſſed at her inability to diſſipate ſo melancholy an impreſſion, prevailed on him to give her the *ſcore*. He afterwards appearing ſomewhat tranquillized, and more maſter of himſelf, ſhe returned the *ſcore* to him, and he ſoon relapſed into his former deſpondency. On the day of his death he aſked for the *requiem*, which was accordingly brought to his bed: "Was I not right (ſaid he), when I declared that it was for myſelf I was compoſing this funeral piece?" And the tears trickled from his eyes. This production of a man, impreſſed during its compoſition with a preſentiment of his approaching death, is *unique* in its kind, and contains paſſages which have frequently drawn tears from the performers.

Only one complaint eſcaped him during his malady: "I muſt quit life (ſaid he), preciſely at the moment when I could enjoy it, free from care and inquietude; at the very time when, independent of ſordid ſpeculations, and at liberty to follow my own principles and inclinations, I ſhould only have to write from the impulſes of my own heart: and I am torn from my family juſt when in a ſituation to ſerve it." Mozart, at the time of his death, was conſiderably involved in debt; but Vienna and Prague diſputed the honour of providing for his widow and children.

The countenance of this great maſter did not indicate any thing uncommon. He was ſmall of ſtature; and, except his eyes, which were full of fire, there was nothing to announce ſuperiority of talent. His air, unleſs when he was at the harpſichord, was that of an abſent man. But when he was performing, his whole phyſiognomy became changed: a profound ſeriouſneſs recalled and fixed his eyes; and his ſentiments were expreſſed in every movement of his muſcles. Never has a muſician more ſucceſsfully embraced the whole extent of his art, and ſhone with greater luſtre in all its departments. His great operas, no leſs than his moſt ſimple ſongs; his learned ſymphonies as well as his airy dances—all carry the ſtamp of the richeſt imagination, the deepeſt ſenſibility, and the pureſt taſte. All his works develope the originality of his genius; and imply a mind great and exalted; an imagination which ſtrikes out for itſelf a new courſe. He therefore merits to be ranked with that ſmall number of original geniuſes, thoſe *phænomena ſplendida*, who form an epoch in their art, by carrying it to perfection, or giving it an unknown career.

It is in the employment of wind inſtruments that Mozart diſplays his greateſt powers. His melody is always ſimple, natural, and full of force; and expreſſes with preciſion the ſentiments and individual ſituations of his perſonages. He wrote with extraordinary facility. "*La Clemence de Titus*," the reader will recollect, coſt him the ſtudy of but eighteen days; and his *requiem*, which is equal in length to an opera, was produced in four weeks. It is alſo worthy of remark, that the overture to his *Don Giovanni* was not begun till the night before the piece was to be performed. At midnight, after having devoted the evening to amuſement, he locked himſelf up in his ſtudy, and compoſed it in a few hours. His memory was wonderfully retentive, as we may judge from his copying by recollection the *miſerere* at Rome. But a fact equally aſtoniſhing is, that, ſoon diſcovering the eagerneſs of people to procure his works, and fearful that they might be pirated, it was his conſtant cuſtom to tranſcribe from the *ſcores* of his ſonatas only a part for one hand, and at the public performance to ſupply the other by memory.

He very early began to diſplay that true dignity of an artiſt which renders him indifferent to the praiſes of thoſe who are unqualified to judge. The commendations of the ignorant great he never conſidered as fame. His hearers, whether the wealthy or the titled, muſt have acquired ſome credit for their judgment before he could be ambitious of their applauſe. Indeed he entertained ſo juſt a ſenſe of ſcientific elevation and importance, that he would inſiſt upon reſpect. And the leaſt noiſe or idle babble, while he was at the inſtrument, excited a diſpleaſure which he was too indignant to conceal. Once, to the honour of his feelings, he ſuddenly roſe from his ſeat, and left his inattentive auditory to experience the keen though ſilent reproach of inſulted genius.

His mind was by no means unlettered; nor was it embelliſhed with one ſcience alone. He was maſter of ſeveral languages, and had made conſiderable progreſs in the mathematics. He was honeſt, mild, generous, full of frankneſs; and with his friends had an air at once amiable, gay, and free from the leaſt tincture of pedantry.

Far from viewing with envy the ſucceſs of others, a weakneſs too cloſely interwoven in the general nature of man, he was always juſt to the talents of his fellow profeſſors; and valued and reſpected merit wherever he found it; a clearer proof of which cannot be adduced than the following circumſtance:—At a concert, where a new piece compoſed by the celebrated Joſeph Haydn was performed, a certain muſician, who never diſcovered any thing worthy of praiſe except in his own productions, did not fail to criticiſe the muſic; exclaiming to Mozart, "There now! there again! why, that is not what *I* ſhould have done:" "No; neither ſhould I (replied Mozart); but do you know why? Becauſe neither you nor I ſhould have been able to conceive it."

MUCAROS *Iſland*, near the N. coaſt of Cuba Iſland, in the W. Indies, which with Iſland Verde, lies oppoſite to the Cape Quibannano.—*Morſe.*

MUD *Iſland*, in Delaware river, is 6 or 7 miles below the city of Philadelphia; whereon is a citadel, and a fort which commands the river. On a ſand bar, a large pier has been erected, as the foundation for a battery, to make a croſs fire.—*ib.*

MUD *Lake*, in the State of New-York, is ſmall, and lies between Seneca and Crooked Lakes. It gives riſe to a north branch of Tioga river.—*ib.*

MUGERAS *Iſlands*, otherwiſe called *Men-Eaters* or *Women-Eaters Iſlands*, are 10 leagues S. of Cape Catoche, on the E. coaſt of the peninſula of Yucatan. On the ſouth of them, towards the land, is good anchorage in from 7 to 8 fathoms, and clean ground.—*ib.*

MULATRE, *Point*, in the iſland of Dominica, in the W. Indies. N. lat. 15 16 weſt long. 61 21.—*ib.*

MULATTO *Point*, on the weſt coaſt of S. America is the S. cape of the port of Ancon, 16 or 18 miles north of Cadavayllo river.—*ib.*

MULHEGAN *River*, in Vermont, riſes in Lewis, and empties into Connecticut river, at Brunſwick.—*ib.*

MULLICUS *River*, in New-Jerſey, is ſmall, and has many mills and iron-works upon it, and empties into Little Egg Harbour Bay, 4 miles eaſterly of the town of Leeds. It is navigable 20 miles for veſſels of 60 tons.—*ib.*

MUMBO-JUMBO, a ſtrange bugbear employed by the Pagan Mandingoes (ſee MANDING, *Suppl.*) for the purpoſe of keeping their women in ſubjection. Polygamy being allowed among theſe people, every man marries as many wives as he can conveniently maintain; and the conſequence is, that family quarrels ſometimes riſe to ſuch a height, that the huſband's authority is not ſufficient to reſtore peace among the ladies. On theſe occaſions, the interpoſition of *Mumbo-Jumbo* is called in; and it is always deciſive. This ſtrange miniſter of juſtice, who is either the huſband himſelf, or ſome perſon inſtructed by him, diſguiſed in a ſort of maſquerade habit, made of the bark of trees, and armed with the rod of public authority, announces his coming by loud and diſmal ſcreams in the woods near the town. He begins the pantomine at the approach of night; and as ſoon as it is dark, he enters the town, and proceeds to the *Bentang* or market-place, at which all the inhabitants immediately aſſemble.

It may eaſily be ſuppoſed that this exhibition is not much reliſhed by the women; for as the perſon in diſguiſe is entirely unknown to them, every married female ſuſpects that the viſit may poſſibly be intended for herſelf; but they dare not refuſe to appear when they are ſummoned; and the ceremony commences with ſongs and dances, which continue till midnight, about which time Mumbo fixes on the offender. This unfortunate victim being thereupon immediately ſeized, is ſtripped naked, tied to a poſt, and ſeverely ſcourged with Mumbo's rod, amidſt the ſhouts and deriſion of the whole aſſembly; and it is remarkable, that the reſt of the women are the loudeſt in their exclamations on this occaſion againſt their unhappy ſiſter. Daylight puts an end to this indecent and unmanly revel. It is truly aſtoniſhing that the women ſhould be deluded by ſo clumſey an impoſture, and that the men ſhould ſo faithfully keep their own ſecret. That the women are deluded ſeems evident; for Mr Park aſſures us, that the dreſs of Mumbo is ſuffered to hang on a tree at the entrance of each town; which could hardly be the caſe, if the women were not perſuaded that it is the dreſs of ſome ſupernatural being.

MUNCY, a creek which empties into the Suſquehannah from the N. E. about 23 miles N. of the town of Northumberland.—*Morſe.*

MUNSHY, a Perſian ſecretary or writer.

MUNSIES, DELAWARES, and SAPOONES, three Indian tribes, who inhabit at Diagho, and other villages up the N. branch of Suſquehannah river. About 20 years ago, the two firſt could furniſh 150 warriors each, and the Sapoones 30 warriors.—*Morſe.*

MUNSUB, in the language of Bengal, a dignity or command conferred by the emperor.

MUNSUBDAR, a dignitary or commander.

MURFREESBOROUGH, a poſt-town of N. Carolina, and capital of Gates county. It is ſituated on Meherrin river, and contains a few houſes, a court-houſe, gaol, and tobacco ware-houſe. It carries on a ſmall trade with Edenton, and the other ſea-port towns. It is 3 miles from Princeton, 12 from Winton, 50 N. by W. of Edenton, and 422 S. W. of Philadelphia.—*Morſe.*

MURGA MORGA *River*, on the coaſt of Chili in S. America, is ſouthward of the S. point of Quintero Bay, and not far from the entrance into Chili river. It is not navigable, but is very good to water in.—*ib.*

MURRAY (William), afterwards Earl of Mansfield and Lord Chief Juſtice of England, was the fourth ſon of David Viſcount Stormont. He was born on the 2d day of March 1705 at Perth, in the kingdom of Scotland, of which kingdom his father was a peer. His reſidence in Scotland, however, was of ſhort duration; for he was carried up to London at the early age of three years. Hence his total exemption from the peculiarities of the dialect of his native country.

At the age of fourteen he was admitted as a king's ſcholar of Weſtminſter ſchool; and during his reſidence in that ſeminary, ſays his contemporary Biſhop Newton, he gave early proofs of his uncommon abilities, not ſo much in his poetry, as in his other exerciſes; and particularly in his declamations, which were ſure tokens and prognoſtics of that eloquence which grew up to ſuch maturity and perfection at the bar, and in both houſes of parliament. At the election in May 1723, he ſtood firſt on the liſt of thoſe gentlemen who were ſent to Oxford, and was entered of Chriſt Church, June the 18th, in that year. In the year 1727 he had taken the degree of B. A. and on the death of King George the Firſt, was amongſt thoſe of the univerſity who compoſed verſes on that event.

In April 1724 he was admitted a ſtudent of Lincoln's Inn, though he ſtill continued to reſide much in the univerſity; where, on the 26th of June 1730, he took the degree of M. A. and ſoon afterwards left Oxford, determined to make the tour of Europe before he ſhould devote himſelf ſeriouſly to buſineſs. About this period he wrote two letters to a young nobleman on the ſtudy of ancient and modern hiſtory, which are publiſhed by his biographer Mr Holliday, and ſhew how amply his own mind was then ſtored with general literature.

On his return to England he commenced his legal ſtudies; but proceeded not in the way then uſually adopted, of labouring in the chambers of a ſpecial pleader, or copying (to uſe the words of Blackſtone) the traſh of an attorney's office. Being bleſſed with the powers of oratory in their higheſt perfection, and having ſoon an opportunity of diſplaying them, he very early acquired the notice of the chancellor and the judges, as well as the confidence of the inferior practiſers. How much he was regarded in the houſe of lords, Pope's well-known couplet will prove:

Grac'd as thou art with all the power of words,
So known, ſo honour'd at the houſe of lords.

The graces of his elocution, however, produced their uſual effect with a certain claſs of people, who would not believe that ſuch bright talents could aſſociate with the more ſolid attainments of the law, or that a man of genius and vivacity could be a profound lawyer. As Pope obſerved at that time,

The Temple late two brother ſergeants ſaw,
Who deem'd each other oracles of law;
With equal talents theſe congenial ſouls,
One lull'd the exchequer, and one ſtunn'd the rolls;
Each had a gravity would make you ſplit,
And ſhook his head at Murray as a wit.

It is remarkable that this ridiculous prejudice accompanied Lord Mansfield to the end of his judicial life, in ſpite of daily proofs exhibited in the court of King's Bench and in the Houſe of Lords, of very profound knowledge of the abſtruſeſt points of juriſprudence. Lord Cheſterfield has given his ſanction to this unfounded opinion. In a letter to his ſon, dated Feb. 12. 1754, he ſays, "The preſent Solicitor General Murray has leſs law than many lawyers, but he has more practice than any, merely upon account of his eloquence, of which he has a never-failing ſtream."

In the outſet of Lord Mansfield's life, it will be the leſs ſurpriſing, that a notion ſhould have been entertained of his addicting himſelf to the purſuits of Belles Lettres too much, when the regard ſhewn to him by Mr Pope, who deſpotically ruled the regions of literature at that period, is conſidered. That great Poet ſeemed to entertain a particular affection for our young lawyer, and was eager to ſhew him marks of his regard. He addreſſed to him his imitation of the 6th Epiſtle of the Firſt Book of Horace; and even condeſcended to become his maſter in the art of elocution. "Mr Murray (ſays his biographer) was one day ſurpriſed by a gentleman of Lincoln's Inn, who could take the liberty of entering his rooms without the ceremonious introduction of a ſervant, in the ſingular act of practiſing the graces of a ſpeaker at a glaſs, while Pope ſat by in the character of a friendly preceptor. Mr Murray, on this occaſion, paid that poet the handſome compliment of, *Tu es mihi Mæcenas* (A)."

Whatever propenſities this ſprightly lawyer might have towards polite literature, he did not permit them to divert his attention from his profeſſion. He ſoon diſtinguiſhed himſelf in an extraordinary manner, as may be ſeen by thoſe who are converſant with, or chuſe to refer to the Books of Reports. In the year 1736, the murder of Captain Porteous by a mob in Edinburgh, after he had been reprieved, occaſioned a cenſure to fall on that city, and a bill of pains and penalties was brought into Parliament againſt the Lord Provoſt and the corporation; which, after various modifications, and a firm and unabated oppoſition in every ſtage of its progreſs, paſſed into a law. In both Houſes Mr Murray was employed as an advocate, and ſo much to the ſatisfaction of his clients, that afterwards, in September 1743, he was preſented with the freedom of Edinburgh in a gold box, profeſſedly, as it was declared, for his ſignal ſervices by his ſpeeches to both Houſes of Parliament in the conduct of that buſineſs.

On the 24th of November 1738, he had married Lady Elizabeth Finch, daughter of the Earl of Winchelſea, and in the month of November 1742, was appointed Solicitor General in the place of Sir John Strange, who reſigned (B). He likewiſe was choſen to repreſent the town of Boroughbridge in Parliament, for which place he was alſo returned in 1747 and 1754.

In the month of March 1746-7 he was appointed one of the managers for the impeachment of Lord Lovat by the Houſe of Commons, and it fell to his lot to obſerve on the evidence previous to the Lords giving their judgment. This taſk he executed with ſo much candour, moderation, and gentleman-like propriety, that Lord Talbot, at the concluſion of his ſpeech, paid him the following compliment: "The abilities of the learned manager who juſt now ſpoke, never appeared with greater ſplendour than at this very hour, when his candour and humanity has been joined to thoſe great abilities which have already made him ſo conſpicuous, that I hope one day to ſee him add luſtre to the dignity of the firſt civil employment in this nation." Lord Lovat himſelf alſo bore teſtimony to the abilities of his adverſary: "I thought myſelf (ſays his lordſhip) very much loaded by one Murray (C), who your Lordſhips know was the bittereſt evidence there was againſt me. I have ſince

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(A) It is thus that eminence is attained even by genius, and Mr Murray was properly employed; though we do not clearly perceive the uſe of the glaſs, when his maſter was watching all his geſtures.

(B) On this occaſion a doggrel poem was publiſhed by one Morgan, a perſon then at the bar, entitled, "The Cauſidicade," in which all the principal lawyers were ſuppoſed to urge their reſpective claims to the poſt. At the concluſion it is ſaid,

Then Murray, prepar'd with a fine panegyric
In praiſe of himſelf, would have ſpoke it like Garrick;
But the Preſident ſtopping him ſaid, "As in truth
"Your worth and your praiſe is in every one's mouth,
"'Tis needleſs to urge what's notoriouſly known,
"The office, by merit, is your's all muſt own;
"The voice of the public approves of the thing,
"Concurring with that of the Court and the King."

(C) One of the evidences againſt him.

ſince ſuffered by another Mr Murray, who, I muſt ſay with pleaſure, is an honour to his country, and whoſe eloquence and learning is much beyond what is to be expreſt by an ignorant man like me. I heard him with pleaſure, though it was againſt me. I have the honour to be his relation, though perhaps he neither knows it nor values it. I wiſh that his being born in the North may not hinder him from the preferment that his merit and learning deſerve."

During the time that Mr Murray continued in office, he ſupported, with great ability, the adminiſtration with which he was connected; and, of courſe, rendered himſelf obnoxious to thoſe who were in oppoſition. Nothing, however, could be urged either againſt his public conduct or his private life; but he was involved in ſome trouble by an ill-deviſed tale, concurring with the known principles of the family of Stormont, to make him ſuſpected of Jacobitiſm. Of this affair, a full and particular account is given by the late Lord Melcombe in the following words:

"Meſſrs Murray, Fawcett, and Stone, were much acquainted, if not ſchool-fellows, in earlier life. Their fortune led them different ways; Fawcett's was to be a country lawyer and recorder of Newcaſtle. Johnſon, now Biſhop of Glouceſter, was one of their aſſociates.

On the day the King's birth-day was kept, they dined at the Dean of Durham's at Durham; this Fawcett, Lord Ravenſworth, Major Daviſon, and one or two more, who retired after dinner into another room. The converſation turning upon the late Biſhop of Glouceſter's preferments, it was aſked who was to have his prebend of Durham? The Dean ſaid, that the laſt news from London was, that Dr Johnſon was to have it: Fawcett ſaid, he was glad that Johnſon got off ſo well, for he remembered him a Jacobite ſeveral years ago, and that he uſed to be with a relation of his who was very diſaffected, one Vermon, a mercer, where the Pretender's health was frequently drunk. This paſſing among a few familiar acquaintance, was thought no more of at the time: it ſpread, however, ſo much in the North (how I never heard accounted for), and reached town in ſuch a manner, that Mr Pelham thought it neceſſary to deſire Mr Vane, who was a friend to Fawcett, and who employed him in his buſineſs, to write to Fawcett, to know if he had ſaid this of Johnſon, and if he had, if it was true.

"This letter was written on the 9th of January; it came to Newcaſtle the Friday following. Fawcett was much ſurpriſed; but the poſt going out in a few hours after its arrival, he immediately acknowledged the letter by a long, but not very explicit, anſwer. This Friday happened to be the club day of the neighbouring gentlemen at Newcaſtle. As ſoon as Lord Ravenſworth, who was a patron and employer of Fawcett, came into the town, Fawcett acquainted him with the extraordinary letter he had received; he told him that he had already anſwered it; and being aſked to ſhew the copy, ſaid he kept none; but deſired Lord Ravenſworth to recollect if he held ſuch a converſation at the Deanry of Durham the day appointed for the birth-day. Ravenſworth recollected nothing at all of it: they went to the club together, and Ravenſworth went the next morning to ſee his mother in the neighbourhood, with whom he ſtaid till Monday; but this thing of ſuch conſequence lying upon his thoughts, he returned by Newcaſtle. He and Fawcett had another converſation; and in endeavouring to refreſh each other's memory about this dreadful delinquency of Johnſon, Fawcett ſaid he could not recollect poſitively at ſuch a diſtance of time, whether Johnſon drank theſe healths, or had been preſent at the drinking of them, but that Murray and Stone had done both ſeveral times. Ravenſworth was exceſſively alarmed at this with relation to Stone, on account of his office about the prince; and thus the affair of Johnſon was quite forgotten, and the epiſode became the principal part. There were many more conferences between Ravenſworth and Fawcett upon this ſubject, in which the latter always perſiſted that Stone and Murray were preſent at the drinking, and did drink thoſe healths. It may be obſerved here, that when he was examined upon oath, he ſwore to the year 1731 or 1732, at lateſt. Fawcett comes up as uſual about his law buſineſs, and is examined by Meſſrs Pelham and Vane, who never had heard of Murray or Stone being named: he is aſked, and anſwers only with relation to Johnſon, never mentioning either of the others; but the love of his country, his king, and poſterity, burned ſo ſtrongly in Ravenſworth's boſom, that he could have no reſt till he had diſcovered this enormity. Accordingly, when he came to town, he acquainted the miniſtry and almoſt all his great friends with it, and inſiſted upon the removal of Stone. The miniſtry would have ſlighted it as it deſerved; but as he perſiſted, and had told ſo many of it, they could not help laying it before the king, who, though he himſelf ſlighted it, was adviſed to examine it; which examination produced this moſt injudicious proceeding in parliament.*"

This is Lord Melcombe's account; and the ſame author informs us, that Mr Murray, when he heard of the committee being appointed to examine this idle affair, ſent a meſſage to the king, humbly to acquaint him, that if he ſhould be called before ſuch a tribunal on ſo ſcandalous and injurious an account, he would reſign his office, and would refuſe to anſwer. It came, however, before the Houſe of Lords, 22d January 1753, on the motion of the Duke of Bedford.

The debate was long and heavy, ſays Lord Melcombe; the Duke of Bedford's performance moderate enough; he divided the Houſe, but it was not told, for there went below the bar with him the Earl Harcourt, Lord Townſhend, the Biſhop of Worceſter, and Lord Talbot only. The Biſhop of Norwich and Lord Harcourt both ſpoke, not to much purpoſe; but neither of them in the leaſt ſupported the Duke's queſtion.

Upon the whole, Lord Melcombe concludes, "It was the worſt judged, the worſt executed, and the worſt ſupported point that I ever ſaw of ſo much expectation."

The King, his late Majeſty, viewed it in its true light; and is reported to have ſaid, "Whatever they were when Weſtminſter boys, they are now my very good friends." He was likewiſe, as we have been informed by a gentleman connected with the family of Stormont, ſo delighted with Mr Murray's ſpeech in his own vindication, that he deſired to have a copy of it, as a model of dignified and candid eloquence. Fawcett, the original author of the ſtory, ſeems indeed to have been a very ſneaking knave, totally unworthy of credit. Biſhop Johnſon, who was overlooked in the

* *Lord Melcombe's Diary*, p. 220.

turmoil, excited by the ſuppoſed guilt of Murray and Stone (ſee Stone, in this *Suppl.)*, went to Fawcett's chambers in the Temple, and deſired an interview. Being told by the ſervant that his maſter was not at home, he renewed his viſit very early next morning, and declared his reſolution to wait till Mr Fawcett ſhould riſe, the laundreſs having inadvertently confeſſed that he was ſtill in bed. Fawcett, upon this, left his thorny pillow with reluctance; for ſomething ſharper than thorns (ſays Mr Holliday) awaited him, which he could not now poſſibly avoid. The reſult of the interview produced expreſſions of deep contrition, together with a letter, addreſſed to the Lord Biſhop of Glouceſter, acknowledging, in the moſt explicit terms, that his Lordſhip was innocent of the charge which he had been the inſtrument of bringing againſt him.

On the advancement of Sir Dudley Rider to the chief juſticeſhip of the King's Bench in 1754, Mr Murray ſucceeded him as attorney general; and on his death, November 1756, again became his ſucceſſor as chief juſtice, when he was created Baron of Mansfield, in the county of Nottingham, with remainder to the heirs male of his body lawfully begotten.

As ſoon as Lord Mansfield was eſtabliſhed in the King's Bench, he began to make improvements in the practice of that court. On the 12th of November, four days after he had taken his ſeat, he made a very neceſſary regulation, obſerving, "Where we have no doubt, we ought not to put the parties to the delay and expence of a farther argument; nor leave other perſons, who may be intereſted in the determination of a point ſo general, unneceſſarily under the anxiety of ſuſpence."

The anxiety of ſuſpence, from this period, was no longer to be complained of in the court of King's Bench. The regularity, punctuality, and diſpatch of the new chief juſtice, afforded ſuch general ſatisfaction, that they, in proceſs of time, drew into that court moſt of the cauſes which could be brought there for determination.

Sir James Burrows ſays, "I am informed, that at the ſittings for London and Middleſex only, there are not ſo few as 800 cauſes ſet down in a year, and all diſpoſed of. And though many of them, eſpecially in London, are of conſiderable value, there are not more, upon an average, than between 20 and 30 ever heard of afterwards in the ſhape of ſpecial verdicts, ſpecial caſes, motions for new trials, or in arreſt of judgment. Of a bill of exceptions there has been no inſtance (I do not include judgments upon criminal proſecutions; they are neceſſary conſequences of the convictions). My reports give but a very faint idea of the extent of the whole buſineſs which comes before the court: I only report what I think may be of uſe as a determination or illuſtration of ſome matter of law. I take no notice of the numerous queſtions of fact which are heard upon affidavits (the moſt tedious and irkſome part of the whole buſineſs). I take no notice of a variety of conteſtations, which, after having been fully diſcuſſed, are decided without difficulty or doubt. I take no notice of many caſes which turn upon a conſtruction ſo peculiar and particular, as not to be likely to form a precedent for any other caſe. And yet, notwithſtanding this immenſity of buſineſs, it is notorious, that, in conſequence of method, and a few rules which have been laid down to prevent delay (even where the parties themſelves would willingly conſent to it), nothing now hangs in court. Upon the laſt day of the very laſt term, if we exclude ſuch motions of the term as by deſire of the parties went over of courſe as peremptories, there was not a ſingle matter of any kind that remained undetermined, excepting one caſe relating to the proprietary Lordſhip of Maryland, which was profeſſedly poſtponed on account of the preſent ſituation of America. One might ſpeak to the ſame effect concerning the laſt day of any former term for ſome years backward."

The ſame author alſo informs us, that, excepting two caſes, there had not been, from the 6th of November 1756 to the time of his then preſent publication, 26th May 1776, a final difference of opinion in the court in any caſe, or upon any point whatſoever. "It is remarkable, too (he adds), that, excepting theſe two caſes, no judgment given during the ſame period has been reverſed, either in the exchequer chamber or in parliament: and even theſe reverſals were with great diverſity of opinion among the judges." Of the two caſes here mentioned, one was the famous queſtion concerning literary property, which the majority of the judges of the court of King's Bench held to be permanent; and in ſupport of which opinion, ſuch arguments were urged by the chief juſtice, as have not yet perhaps been completely anſwered.

The ill ſucceſs of the war, which had lately been begun, occaſioned a change in the adminiſtration; and the conflicts of contending parties rendered it impracticable for the crown, at that juncture, to ſettle a new miniſtry. In order, therefore, to give pauſe to the violence of both ſides, Lord Mansfield was induced to accept the poſt of chancellor of the exchequer on the 9th of April 1757; which he held until the 2d of July in the ſame year. During this interval, he employed himſelf, with great ſucceſs, to bring about a coalition; which being effected, produced a ſeries of events, which raiſed the glory of Great Britain to the higheſt point at which it has ever been ſeen. In the ſame year he was offered, but refuſed, the office of Lord High Chancellor; and in November 1758, he was elected a governor of the charter houſe, in the room of the Duke of Marlborough, then lately deceaſed.

For ſeveral years after this period, the tenor of Lord Mansfield's life was marked only with a moſt ſedulous diſcharge of the duties of his office. In 1760 Geo. II. died, and the new reign commenced with alterations in the adminiſtration; which gave riſe to a virulent ſpirit of oppoſition, conducted with a degree of violence and aſperity never known at any former time. As a friend to the then adminiſtration, Lord Mansfield was marked out for a more than ordinary ſhare of malicious invective. It is in alluſion to this, that Warburton, after tracing the riſe and progreſs of the irreligion and licentiouſneſs which then prevailed, and obſerving that, amid ſuch general corruption, the pure adminiſtration of public juſtice ſtill afforded a cheerful conſolation to thinking men, proceeds thus:

"But the evil genius of England would not ſuffer us to enjoy it long; for, as if envious of this laſt ſupport of government, he hath now inſtigated his blackeſt agents to every extent of their malignity; who, after the moſt villainous inſults on all other orders and ranks in ſociety, have at length proceeded to calumniate even the king's ſupreme court of juſtice, under its ableſt and moſt unblemiſhed adminiſtration. After this, who will not be tempted to deſpair of his country, and ſay with the good old man in the ſcene,

——" *Ipſa ſi cupiat ſalus*
" *Servare, prorſus non poteſt, hanc Familiam* (D)?"

A change of adminiſtration again took place in 1765, which introduced the Marquis of Rockingham and his friends to govern the country; and the meaſures then adopted not agreeing with Lord Mansfield's ſentiments, he, for the firſt time, became an opponent of government. On the bill for repealing the ſtamp act, he ſpoke, and divided againſt it; and is ſuppoſed to have had ſome ſhare in the compoſition of the proteſts on that occaſion, though he did not ſign them. In the ſame year, he is ſaid to have animadverted, with no ſmall degree of ſeverity, on the incautious expreſſions of Lord Camden, on the affair of prohibiting the exportation of corn, that it was but a 40 days tyranny at the outſide (E).

In 1767, the Diſſenters cauſe was determined, in which Lord Mansfield delivered a ſpeech, which has ſince been printed, and ſhews his Lordſhip to have been a ſteady friend to religious toleration, as well as to the rights of the eſtabliſhed church. The conſcientious Diſſenters themſelves laviſhed upon that ſpeech the higheſt praiſe; whilſt others of them, in the ſucceeding year, deluged the public prints with torrents of abuſe on the Chief Juſtice. In that year was the general election. Mr Wilkes returned from abroad, became a candidate for the city of London, and afterwards was choſen repreſentative for the county of Middleſex. Having been outlawed ſome years before, he now applied for a reverſal of that proceeding. On the 8th of June, the conſideration of it came before the court of King's Bench; when the judges delivered their opinions very fully, and were unanimous that the outlawry was illegal, and muſt be reverſed. On this occaſion Lord Mansfield took the opportunity of entering into a full ſtatement of the caſe, and a juſtification of his own conduct. The reader will find the caſe reported by Sir James Burrow; from whom we ſhall extract the following, which appears to have been the moſt important part of his Lordſhip's ſpeech:

" It is fit to take ſome notice of the various terrors hung out; the numerous crowds which have attended, and now attend, in and about the hall, out of all reach of hearing what paſſes in court; and the tumults which in other places have ſhamefully inſulted all order and government. Audacious addreſſes in print dictate to us, from thoſe they call the people, the judgment to be given now, and afterwards upon the conviction. Reaſons of policy are urged, from danger to the kingdom, by commotions and general confuſion.

" Give me leave to take the opportunity of this great and reſpectable audience, to let the whole world know all ſuch attempts are vain. Unleſs we have been able to find an error which will bear us out to reverſe the outlawry, it muſt be affirmed. The conſtitution does not allow reaſons of ſtate to influence our judgment: God forbid it ſhould! We muſt not regard political conſequences, how formidable ſoever they may be; we are bound to ſay, *Fiat Juſtitia, ruat Cœlum.* The conſtitution truſts the king with reaſons of ſtate and policy: He may pardon offences; it is his to judge whether the law or the criminal ſhould yield. We have no election. None of us encouraged or approved the commiſſion of either of the crimes of which the defender is convicted: none of us had any hand in his being proſecuted. As to myſelf, I took no part (in another place) in the addreſſes for that proſecution. We did not adviſe or aſſiſt the defender to fly from juſtice; it was his own act, and he muſt take the conſequences. None of us have been conſulted, or had any thing to do with the preſent proſecution. It is not in our power to ſtop it; it was not in our power to bring it on. We cannot pardon. We are to ſay what we take the law to be. If we do not ſpeak our real opinions, we prevaricate with God and our own conſciences.

" I paſs over many anonymous letters I have received: thoſe in print are public; and ſome of them have been brought judicially before the court. Whoever the writers are, they take the wrong way. I will do my duty unawed. What am I to fear? That *mendax infamia* from the preſs, which daily coins falſe facts and falſe motives? The lies of calumny carry no terror to me. I truſt, that my temper of mind, and the colour and conduct of my life, have given me a ſuit of armour againſt theſe arrows. If, during this king's reign, I have ever ſupported his government, and aſſiſted his meaſures, I have done it without any other reward than the conſciouſneſs of doing what I thought right. If I have ever oppoſed, I have done it upon the points themſelves, without any collateral views. I honour the king, and reſpect the people. But many things acquired by the favour of either are, in my account, objects not worth ambition. I wiſh popularity; but it is that popularity which follows, not that which is run after.—It is that popularity which, ſooner or later, never fails to do juſtice to the purſuit of noble ends by noble means. I will not do that which my conſcience tells me is wrong upon this occaſion, to gain the huzzas of thouſands, or the daily praiſe of all the papers which come from the preſs. I will not avoid doing what I think is right, though it ſhould draw on me the whole artillery of libels, all that falſehood and malice can invent, or the credulity of a deluded populace can ſwallow. I can ſay with a great magiſtrate, upon an occaſion, and under circumſtances not unlike, '*Ego hoc animo ſemper fui, ut invidiam virtute partam, gloriam, non invidiam putarem.*'

" The threats go further than abuſe: Perſonal violence is denounced. I do not believe it: it is not the genius of the worſt men of this country in the worſt of times. But I have ſet my mind at reſt. The laſt end that can happen to any man never comes too ſoon, if

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(D) See the dedication of the 5th edition of the Divine Legation of Moſes, which deſerves to be read at preſent with peculiar attention, as the work of a man of gigantic talents, deeply read in law as well as in theology.

(E) The ſpeeches in the debate were never printed; but the ſubſtance of them all was conſolidated in a pamphlet publiſhed at the time, intitled, " A ſpeech againſt the ſuſpending and diſpenſing prerogative," 8vo. Since reprinted in Debrett's Debates, Vol. IV. p. 384.

he falls in ſupport of the law and liberty of his country (for liberty is ſynonymous to law and government). Such a ſhock, too, muſt be productive of public good: It might awake the better part of the kingdom out of that lethargy which ſeems to have benumbed them; and bring the mad part back to their ſenſes, as men intoxicated are ſometimes ſtunned into ſobriety.

"Once for all, let it be underſtood, that no endeavours of this kind will influence any man who at preſent ſits here. If they had any effect, it would be contrary to their intent: Leaning againſt their impreſſion might give a bias the other way. But I hope, and I know, that I have fortitude enough to reſiſt even that weakneſs. No libels, no threats, nothing that has happened, nothing that can happen, will weigh a feather againſt allowing the defendant, upon this and every other queſtion, not only the whole advantage he is intitled to from ſubſtantial law and juſtice, but every benefit from the moſt critical nicety of form, which any other defender could claim under the like objection. The only effect I feel is an anxiety to be able to explain the grounds upon which we proceed; ſo as to ſatisfy all mankind, that a flaw of form given way to in this caſe, could not have been got over in any other."

In January 1770, Lord Mansfield again was offered the Great Seal, which was given to Mr Charles York: and in Hilary Term 1771, he a third time declined the ſame offer, and the Seal was entruſted to Lord Bathurſt.

The year 1770 was alſo memorable for various attacks made on his Lordſhip's judicial character, in both the Houſes of Lords and Commons. In one of theſe, the propriety of a direction given to the jury in the caſe of the king and Woodfal was called in queſtion; which occaſioned his Lordſhip to produce to the Houſe a copy of the unanimous opinion of the court of King's Bench in that cauſe; which, after being much canvaſſed and oppoſed, was ſuffered to ſtand its ground without being over-ruled.

On the 19th of October 1776, his Lordſhip was advanced to the dignity of an Earl of Great Britain, by the title of the Earl of Mansfield, and to his male iſſue; and for want of ſuch iſſue, to Louiſa Viſcounteſs Stormont, and to her heirs male by David Viſcount Stormont her huſband. The ſame title, in 1792, was limited to Lord Stormont himſelf; who afterwards ſucceeded to it.

We come now to a period of his Lordſhip's life, which furniſhes an event diſgraceful to the age and country in which the fact was committed. An union of folly, enthuſiaſm, and knavery, had excited alarms in the minds of ſome weak people, that encouragements were given to the favourers and profeſſors of the Roman Catholic faith inconſiſtent with religion and true policy. The act of Parliament, which excited the clamour, had paſſed with little oppoſition, and had not received any extraordinary ſupport from Lord Mansfield. The minds of the public were inflamed by artful miſrepreſentations; the rage of a popular mob was ſoon directed towards the moſt eminent perſons. Accordingly, in the night between Tueſday the 6th and Wedneſday the 7th of June 1780, his Lordſhip's houſe in Bloomſbury Square was attacked by a party of rioters, who, on the Friday and Tueſday preceding, had, to the amount of many thouſands, ſurrounded the avenues of both Houſes of Parliament, under pretence of attending Lord George Gordon when he preſented the petition from the Proteſtant Aſſociation. On Tueſday evening the priſon of Newgate had been thrown open, all the combuſtible part reduced to aſhes, and the felons let looſe upon the public. It was after this attempt to deſtroy the means of ſecuring the victims of criminal juſtice that the rioters aſſaulted the reſidence of the chief magiſtrate of the firſt criminal court in the kingdom; nor were they diſperſed till they had burnt all the furniture, pictures, books, manuſcripts, deeds, and, in ſhort, every thing which fire could conſume in his Lordſhip's houſe; ſo that nothing remained but the walls, which were ſeen next morning almoſt red hot from the violence of the flames, preſenting a melancholy and awful ruin to the eyes of the paſſengers. For a fuller account of thoſe dreadful riots, ſee BRITAIN, n° 644. *Encyclopædia.*

So unexpected was this daring outrage on order and government, that it burſt on Lord Mansfield without his being prepared in the ſlighteſt manner to reſiſt it. He eſcaped with his life only, and retired to a place of ſafety, where he remained until the 14th of June, the laſt day of term, when he again took his ſeat in the court of King's Bench. "The reverential ſilence (ſays Mr Douglas) which was obſerved when his Lordſhip reſumed his place on the Bench, was expreſſive of ſentiments of condolence and reſpect, more affecting than the moſt eloquent addreſs the occaſion could have ſuggeſted.

"The amount of that part of Lord Mansfield's loſs which might have been eſtimated, and was capable of a compenſation in money, is known to have been very great. This he had a right to recover againſt the *hundred*. Many others had taken that courſe; but his Lordſhip thought it more conſiſtent with the dignity of his character not to reſort to the indemnification provided by the legiſlature. His ſentiments, on the ſubject of a reparation from the ſtate, were communicated to the Board of Works in a letter, dated 18th July 1780, written in conſequence of an application which they had made to him (as one of the principal ſufferers), purſuant to directions from the treaſury, founded on a vote of the Houſe of Commons, requeſting him to ſtate the nature and amount of his loſs. In that letter, after ſome introductory expreſſions of civility to the ſurveyor general, to whom it was addreſſed, his Lordſhip ſays, 'Beſides what is irreparable, my pecuniary loſs is great. I apprehended no danger, and therefore took no precaution. But how great ſoever that loſs may be, I think it does not become me to claim or expect reparation from the ſtate. I have made up my mind to my misfortune, as I ought, with this conſolation, that it came from thoſe whoſe object manifeſtly was general confuſion and deſtruction at home, in addition to a dangerous and complicated war abroad. If I ſhould lay before you any account or computation of the pecuniary damage I have ſuſtained, it might ſeem a claim or expectation of being indemnified. Therefore you will have no further trouble upon this from, &c.—*Mansfield*.'"

From this time the luſtre of Lord Mansfield continued to ſhine with unclouded brightneſs until the end of his political life, unleſs his oppoſition to the meaſures of the preſent adminiſtration, at the early period of their appointment, ſhall be thought to detract, in ſome ſmall degree, from his merit. It is certain many of his admirers ſaw, with concern, a connection with the opponents of government at that juncture, ſcarce compatible with the dignity of the chief juſtice of Great Britain. At length infirmities preſſed upon him, and he became unable to attend his duty with the ſame punctuality and aſſiduity with which he had been accuſtomed. It has been ſuppoſed, that he held his office after he was diſabled from executing the duties of it, from a wiſh to ſecure the ſucceſſion of it to a very particular friend. Be this as it may, the chief juſtice continued in his office until the month of June 1788, when he ſent in his reſignation.

From this period the bodily powers of his Lordſhip continued to decline; his mental faculties, however, remained without decay almoſt to the laſt. During this time he was particularly inquiſitive and anxious about the proceedings in France, and felt his ſenſibility, in common with every good man, wounded by the horrible inſtance of democratic infatuation in the murder of the innocent Louis XVI. He lived juſt long enough to expreſs his ſatisfaction at the check given to the French by the Prince of Cobourg in March 1793; on the 20th of which month, after continuing ſome days in a ſtate of inſenſibility, he departed this life, at the age of 88 years.

" In his political oratory (ſays a writer of the preſent times), he was not without a rival; no one had the honour of *ſurpaſſing* him; and let it be remembered, that his competitor was Pitt.

" The rhetorician that addreſſed himſelf to Tully in theſe memorable words—*Demoſthenes tibi præripuit ne primus eſſes Orator, tu illi ne ſolus*—anticipated their application to Mansfield and Pitt. If the one poſſeſſed Demoſthenean fire and energy, the other was at leaſt a Cicero. Their oratory differed in ſpecies, but was equal in merit. There was, at leaſt, no ſuperiority on the ſide of Pitt. Mansfield's eloquence was not, indeed, of that daring, bold, declamatory kind, ſo irreſiſtibly powerful in the momentary buſtle of popular aſſemblies; but it was poſſeſſed of that pure and Attic ſpirit, and ſeductive power of perſuaſion, that delights, inſtructs, and eventually triumphs. It has been very beautifully and juſtly compared to a river, that meanders through verdant meads and flowery gardens, reflecting in its cryſtal boſom the varied objects that adorn its banks, and refreſhing the country through which it flows.

" To illuſtrate his oratory by example, would require voluminous tranſcripts from the records of Parliament; and it is unneceſſary, as we can appeal to living recollection.

" Having added weight and dignity to the offices of attorney and ſolicitor general, his reputation as a ſpeaker, a lawyer, and a politician, elevated him to the peerage, and the exalted poſt of chief juſtice of England. He aſcended to the dignities of ſtate by rapid ſtrides: they were not beſtowed by the caprice of party favour or affection. They were (as was ſaid of Pliny) liberal diſpenſations of power upon an object that knew how to add new luſtre to that power, by the rational exertion of his own.

" Here we can ſpeak of this great man within our own recollection; and however party prejudices may adopt their different favourites, and each contend in detracting from the merit of the other, it is, we believe, generally underſtood, that precedence is allowed the Earl of Mansfield, as the firſt magiſtrate that ever ſo pre-eminently graced that important ſtation. The wiſdom of his deciſions, and unbiaſſed tenor of his public conduct, will be held in veneration by the ſages of the law, as long as the ſpirit of the conſtitution, and juſt notions of equity, continue to have exiſtence. No man has ever, in an equal degree, poſſeſſed that wonderful ſagacity in diſcovering chicanery and artifice, and ſeparating fallacy from truth, and ſophiſtry from argument, ſo as to hit the exact equity of the caſe. He ſuffered not juſtice to be ſtrangled in the nets of form.

" His memory was aſtoniſhing—he never took notes, or, if he did, ſeldom or ever conſulted them." His references to expreſſions which fell from him in the courſe of the debate, or his quotations from books, were ſo faithful, that they might have been ſaid to have been repeated *verbatim*. The purpoſes to which he employed theſe amazing talents were ſtill more extraordinary: if it was the weak part of his opponent's arguments that he referred to, he was ſure to expoſe its fallacy, weakneſs, or abſurdity, in the moſt poignant ſatire, or hold it up in the moſt ridiculous point of view. If, on the contrary, it were a point on which his adverſaries laid their chief ſtreſs, he ſtated the words correctly; collected their obvious meaning, conſidered the force of the ſeveral arguments that had or might have been raiſed upon them, with a preciſion that would induce an auditor almoſt to ſuppoſe that he had previouſly conſidered the whole, and that his ſpeech was the reſult of much previous ſtudy.

" It may be ſaid of Mansfield as of Virgil, that if he had any faults, they might be conſidered in the ſame manner with thoſe of ſome eminent fixed ſtar, which, if they exiſt at all, are above the reach of human obſervation. The luminous æther of his life was not obſcured by any ſhade dark enough to be denominated a defect. On account of his deſcent, local prejudices and propenſities were imputed to him, and his conduct, on that account, examined with a microſcopic eye; but the optic through which it was viewed poſſeſſed a party tinge, equally odious and deceptive.

" His political principles were ever conſiſtent; and to preſerve conſiſtency in ſuch ſtations and in ſuch times as occupied the life of Mansfield, conſtitutes an ordeal ſtrongly impreſſive of virtue. It has been ſaid that he wanted ſpirit. Is the uniform oppoſition of popular opinion, and apparently the contempt of it, any proof of the aſſertion? His ſpeech and conduct in the affair of Wilkes's outlawry, when popular prejudice ran in torrents, illuſtrate each other. He deſpiſed (to borrow an expreſſion of his own) that muſhroom popularity that is raiſed without merit, and loſt without a crime. He diſdained being the ſlave of popular impulſe, or to acknowledge the ſhouts of a mob for the trumpet of fame."

He had a mind too great to be aſhamed of revering the ordinances of religion; and as, after the moſt impartial inquiry, he was a firm believer of the truth and importance of Chriſtianity, he frequented the church regularly, and received the holy ſacrament on the higher feſtivals. Mr Holliday has publiſhed a ſermon, which he ſays was dictated by Lord Mansfield to his friend biſhop Johnſon, and preached by that prelate before the Houſe of Lords. It is a very ſerious and appropriate diſcourſe; but judging upon internal evidence, we ſhould not have ſuppoſed it the compoſition of the eloquent and argumentative chief juſtice of England. His Lordſhip's will, which was written with his own hand, upon little more than half a ſheet of paper, begins with the following elegant and pious paragraph, with which we ſhall conclude this ſketch of his character:

“ When it ſhall pleaſe Almighty God to call me to that ſtate, to which, of all I now enjoy I can carry only the ſatisfaction of my own conſcience, and a full reliance upon his mercy through Jeſus Chriſt, I deſire that my body may be interred as privately as may be: and out of reſpect for the place of my early education, I ſhould wiſh it to be in Weſtminſter Abbey.” It was interred in Weſtminſter Abbey, in the ſame vault with the Counteſs (who had died April 10. 1784), between the late Earl of Chatham and Lord Robert Manners.

MUSCLE *Bank*, at the entrance into Trinity Bay or harbour, in the direction of S. W. on the E. coaſt of Newfoundland Iſland.—*Morſe*.

Muscle *Bay*, in the Straits of Magellan, in S. America, is half way between Elizabeth's Bay, and York Road; in which there is good anchorage with a weſterly wind.—*ib.*

Muscle *Bay*, or *Meſſillones*, on the coaſt of Chili or Peru, in S. America, 5 leagues S. by W. of Atacama. —*ib.*

Muscle *Shoals*, in Tenneſſee river, about 250 miles from its mouth, extend about 20 miles, and derive their name from the number of ſhell-fiſh found there. At this place the river ſpreads to the breadth of 3 miles, and forms a number of iſlands; and the paſſage is difficult, except when there is a ſwell in the river. From this place up to the Whirl, or Suck, where the river breaks through the Great Ridge, or Cumberland Mountain, is 250 miles, the navigation all the way excellent.—*ib.*

MUSCONECUNK, a ſmall river of New-Jerſey, which empties into the Delaware 6 miles below Eaſton. —*ib.*

MUSEUM, in the language of the preſent day, is a building in which are depoſited ſpecimens of every object that is in any degree curious, whether ſuch objects be natural or artificial. What the word *muſeum* expreſſed originally, has been told under that title in the *Encyclopædia*.

A complete muſeum contains collections of preſerved beaſts, birds, fiſhes, reptiles, &c.; models of machines; rare manuſcripts; and indeed ſpecimens of every thing neceſſary to illuſtrate phyſical ſcience, to improve art, to aid the antiquarian in his reſearches, and to exhibit the manners and cuſtoms of men in diſtant ages and nations. As natural objects of uncommon ſize or beauty, and other rare productions, were, in the earlieſt periods, conſecrated to the gods, the temples were, of courſe, the firſt repoſitories of ſuch collections, or, in other words, the firſt *Muſeums*. This, we think, has been completely proved by Profeſſor Beckmann.*

* *Inventions*, vol. ii. p. 44.

“ When Hanno (ſays he) returned from his diſtant voyages, he brought with him to Carthage two ſkins of the hairy women whom he found on the Gorgades iſlands, and depoſited them as a memorial in the temple of Juno, where they continued till the deſtruction of the city. The horns of a Scythian animal, in which the Stygian water that deſtroyed every other veſſel could be contained, were ſent by Alexander as a curioſity to the temple of Delphi, where they were ſuſpended, with an inſcription, which has been preſerved by Ælian. The monſtrous horns of the wild bulls which had occaſioned ſo much devaſtation in Macedonia, were, by order of King Philip, hung up in the temple of Hercules. The unnaturally formed ſhoulder bones of Pelops were depoſited in the temple of Elis. The horns of the ſo called Indian ants were ſhewn in the temple of Hercules at Erythræ; and the crocodile found in attempting to diſcover the ſources of the Nile was preſerved in the temple of Iſis at Cæſarea. A large piece of the root of the cinnamon tree was kept in a golden veſſel in one of the temples at Rome, where it was examined by Pliny. The ſkin of that monſter which the Roman army in Africa attacked and deſtroyed, and which probably was a crocodile, an animal common in that country, but never ſeen by the Romans before the Punic war, was, by Regulus, ſent to Rome, and hung up in one of the temples, where it remained till the time of the Numantine war (a). In the temple of Juno, in the iſland of Melita, there were a pair of elephants teeth of extraordinary ſize, which were carried away by Maſiniſſa's admiral, and tranſmitted to that prince, who, though he ſet a high value upon them, ſent them again back, becauſe he heard they had been taken from a temple. The head of a baſiliſc was exhibited in one of the temples of Diana; and the bones of that ſea monſter, probably a whale, to which Andromeda was expoſed, were preſerved at Joppa, and afterwards brought to Rome. In the time of Pauſanias, the head of the celebrated Calydonian boar was ſhewn in one of the temples of Greece; but it was then deſtitute of briſtles, and had ſuffered conſiderably by the hand of time. The monſtrous tuſks of this animal were brought to Rome, after the defeat of Anthony, by the Emperor Auguſtus, who cauſed them to be ſuſpended in the temple of Bacchus. Apollonius tells us, that he ſaw in India ſome of thoſe nuts which in Greece were preſerved in the temples as curioſities.”

Though theſe curioſities were preſerved in the temples for purpoſes very different from thoſe for which our collections are made, there can be no doubt but that they contributed to promote the knowledge of natural hiſtory. If it be true, as Pliny and Strabo inform us, that Hippocrates availed himſelf of the accounts which were hung up in the temple of Æſculapius of different diſeaſes, and of the medicines and mode of treatment by which they were cured; it will eaſily be believed, that the natural hiſtorians availed themſelves, in a ſimilar manner, of the various rare objects which were preſerved in the temples of the other gods. This, we ſee, Pliny actually did.

Suetonius informs us, that Auguſtus had, in his palace, a collection of natural curioſities; and it is well known that Alexander gave orders to all huntſmen, bird-catchers, fiſhermen, and others, to ſend to Ariſtotle whatever rare animals they could procure. M. Beckmann ſeems to be of opinion, that the firſt private muſeum was formed by Apuleius, who, next to Ariſtotle and his ſcholar Theophraſtus, certainly examined natural objects with the greateſt ardour and judgment; who cauſed animals of every kind, and particularly fiſh, to be brought to him either dead or alive, in order to deſcribe their external and internal parts, their number and ſituation, and to determine their characteriſing marks, and eſtabliſh their real names; who undertook diſtant journeys to become acquainted with the ſecrets of nature; and who, on the Getulian mountains, collected petrefactions, which he conſidered as the effects of Deucalion's flood.

(a) We think, with the tranſlator of Beckmann's Hiſtory, that this animal was not the crocodile, but the *Boa conſtrictor*. See Boa and Serpent, *Encycl.*

The principal cauſe why collections of natural curioſities were ſcarce in ancient times, muſt have been the ignorance of naturaliſts in regard to the proper means of preſerving ſuch bodies as ſoon ſpoil or corrupt. Some methods were indeed known and practiſed, but they were all defective and inferior to that by ſpirit of wine, which prevents putrefaction, and which, by its perfect tranſparency, permits the objects which are covered by it to be at all times viewed and examined. Theſe methods were the ſame as thoſe employed to preſerve proviſions, or the bodies of great men deceaſed. They were put into ſalt brine or honey, or were covered over with wax. Thus the hippopotamus, deſcribed by Columna, was ſent to him from Egypt preſerved in ſalt. The body of Ageſipolis King of Sparta, who died in Macedonia, was ſent home in honey; the celebrated purple dye of the ancients was preſerved freſh for many years by the ſame means; and at this day, when the Orientals are deſirous of tranſporting fiſh to any diſtance, they cover them over with wax.

In thoſe centuries which are uſually called the middle ages, the Profeſſor finds no traces of what can be called a muſeum, except in the treaſuries of emperors, kings, and princes, where, beſides articles of great value, curioſities of art, antiquities, and relics, one ſometimes found ſcarce and ſingular foreign animals, which were dried and preſerved. Such objects were to be ſeen in the old treaſury at Vienna; and in that of St. Denis was exhibited the claw of a griffin, ſent by a king of Perſia to Charlemagne; the teeth of the hippopotamus, and other things of the like kind. In theſe collections, the number of the rarities always increaſed in proportion as a taſte for natural hiſtory became more prevalent, and as the extenſion of commerce afforded better opportunities for procuring the productions of remote countries. Menageries were eſtabliſhed to add to the magnificence of courts, and the ſtuffed ſkins of rare animals were hung up as memorials of their having exiſted. Public libraries alſo were made receptacles for ſuch natural curioſities as were from time to time preſented to them; and as in univerſities the faculty of medicine had a hall appropriated for the diſſection of human bodies, curioſities from the animal kingdom were collected there alſo by degrees; and it is probable that the profeſſors of anatomy firſt made attempts to preſerve different parts of animals in ſpirit of wine, as they were obliged to keep them by them for the uſe of their ſcholars; and becauſe in old times dead bodies were not given up to them as at preſent, and were more difficult to be obtained. Private collections appear for the firſt time in the 16th century; and there is no doubt (ſays our author) that they were formed by every learned man who at that period applied to the ſtudy of natural hiſtory.

MUSHROOM, a fungus, of which ſome of the principal ſpecies have been deſcribed in the *Encyclopædia* under the generic name AGARICUS. There is, however, one ſpecies not mentioned there—the *Boletus hirſutus* of Bulliard, which is certainly worthy of notice, ſince one of the French chemiſts has lately extracted from it a bright, ſhining, and very durable yellow dye. This pretty large muſhroom grows commonly on walnut and apple-trees. Its colouring-matter is contained in abundance, not only in the tubular part, but alſo in the parenchyma of the body of the muſhroom. In order to extract it, the muſhroom is pounded in a mortar, and the liquor thence obtained is boiled for a quarter of an hour in water. An ounce of liquor is ſufficient to communicate colouring-matter to ſix pounds of water. When the liquor has been ſtrained, the ſtuff to be dyed is put into it, and boiled for a quarter of an hour. All kinds of ſtuff receive this colour and retain it; but on linen and cotton it is leſs bright. This colour may be modified, in a very agreeable manner, by the effect of mordants.

The proceſs ſucceeded beſt on ſilk. When this ſubſtance, after being dyed, is made to paſs through a bath of ſoft ſoap, it acquires a ſhining golden yellow colour, which has a perfect reſemblance to the yellow of that ſilk employed to imitate embroidery in gold, and which has hitherto been brought from China and ſold at a dear rate, as the method of dyeing it is unknown in Europe. The yellow colour extracted from this muſhroom may be employed alſo with advantage for painting in water-colours as well as in oil.

MUSKINGUM, that is, *Elk's Eye*, a navigable river of the N. W. Territory. It is 250 yards wide at its confluence with the Ohio, 172 miles below Pittſburg, including the windings of the Ohio, though in a direct line it is but 90 miles. At its mouth ſtands Fort Harmar and Marietta. Its banks are ſo high as to prevent its overflowing, and it is navigable by large batteaux and barges to the Three Legs, 110 miles from its mouth, and by ſmall boats to the lake at its head, 45 miles farther. From thence, by a portage of about one mile, a communication is opened to Lake Erie, through Cayahoga, a ſtream of great utility, navigable the whole length, without any obſtruction from falls. From Lake Erie, the avenue is well known to Hudſon's river in the State of New-York. The land on this river and its branches is of a ſuperior quality, and the country abounds in ſprings and conveniences fitted to ſettlements remote from ſea navigation, viz. ſalt-ſprings, coal, free-ſtone, and clay. A valuable ſalt-ſpring has been very lately diſcovered, 8 miles from this river, and 50 from Marietta, called the *Big Spring*. Such a quantity of water flows, as to keep 1000 gallons conſtantly boiling. Ten gallons of this water will, as experiment has proved, afford a quart of ſalt of ſuperior quality to any made on the ſea-coaſt. —*Morſe.*

MUSQUAKIES *Indians* inhabit the ſouthern waters of Lake Michigan, having 200 warriors.—*ib.*

MUSQUATIONS, an Indian tribe inhabiting near Lake Michigan.—*ib.*

MUSKITTO *Cove*, in N. America, lies in lat. 64 55 13, and in long. 53 3 45 W.—*ib.*

Muſquito, || Myerſtown.

MUSQUITO *River* and *Bay* lie at a ſmall diſtance north of Cape Canaverel, on the coaſt of E. Florida. The banks of Muſquito river towards the continent abound in trees and plants common to Florida, with pleaſant orange groves; whilſt the narrow ſtripes of land towards the ſea, are moſtly ſand-hills.—*ib.*

MUSQUITONS, an Indian nation in the neighbourhood of the Piankeſhaws and Outtagomies.—*ib.*

MUTSUDDIES, in Bengal, writers, accountants, officers of government.

MUZCOORET, allowances to zemindars in land or money. See ZEMINDAR, *Suppl.*

MYERSTOWN, a village of Dauphin county, Pennſylvania, ſituated on the N. ſide of Tulpehockon creek, a few miles below the canal. It contains about 25 houſes, and is 32 miles eaſt by north of Harriſburg, and 77 from Philadelphia.—*Morſe.*

Mynomanies, || Myrtle.

MYNOMANIES, or *Minomanies*, an Indian tribe, who with the tribes of the Chipewas and Saukeys, live near Bay Puan, and could together furniſh, about 20 years ago, 550 warriors. The Minomanies have about 300 fighting men.—*ib.*

MYRTLE *Iſland*, one of the Chandeleurs or Myrtle iſlands, in Naſſau Bay, on the coaſt of Florida, on the weſt ſide of the peninſula.—*ib.*

N.

Naaman's, || Nancowry.

NAAMAN'S *Creek*, a ſmall ſtream which runs S. eaſterly into Delaware river, at Marcus Hook. —*Morſe.*

NABOB, or NOWAB, a title of courteſy given in India to Mahomedans high in ſtation, particularly provincial governors.

NAB'S *Bay*, near the weſtern limit of Hudſon's Bay, known by the name of the Welcome Sea. Cape Eſkimaux is its ſouthern point or entrance.—*Morſe.*

NACO, a town of New-Spain, in the province of Honduras, 50 miles north-weſt of Valadolid.—*ib.*

THE SUN'S NADIR, is the axis of the cone projected by the ſhadow of the earth: ſo called, becauſe that axis being prolonged, gives a point in the ecliptic diametrically oppoſite to the ſun.

NAHANT *Point* forms the N. E. point of Boſton harbour, in Maſſachuſetts; 9 miles E. N. E. of Boſton. N. lat. 42 27, W. long. 70 57.—*Morſe.*

NAHUNKEAG, a ſmall iſland in Kennebeck river, 38 miles from the ſea, ſignifies, in the Indian language, the land where eels are taken.—*ib.*

NAIB, a deputy.

NAIN, a Moravian ſettlement, which was eſtabliſhed in 1763, on Lehigh river, in Pennſylvania.—*Morſe.*

NAIN, a ſettlement of the Moravians on the coaſt of Labrador, near the entrance of Davis's Straits, being S. S. W. of Cape Farewell. It was begun under the protection of the Britiſh government, but is now deſerted.—*ib.*

NAKED, in architecture, as the naked of a wall, &c. is the ſurface, or plane, from whence the projectures ariſe; or which ſerves as a ground to the projectures.

NAMASKET, a ſmall river which empties into Narraganſet Bay.—*Morſe.*

Nancowry.

NANCOWRY, or SOURY, as it is ſometimes called, is one of the Nicobar iſles, and ſituated nearly in the centre of the cluſter (See NICOBAR, *Encycl.*). Its length may be about eight miles, and its breadth nearly equal. The iſland of Comerty, which is near it, is more extenſive, but does not perhaps contain more ſolid land, being excavated by a very large bay from the ſea. The ſpace between theſe two iſlands forms a capacious and excellent harbour, the eaſtern entrance of which is ſheltered by another iſland, called Trikut, lying at the diſtance of about a league. The inlet from the weſt is narrow, but ſufficiently deep to admit the largeſt ſhips when the wind is fair.

The Danes have long maintained a ſmall ſettlement at this place, which ſtands on the northern-moſt point of Nancowry, within the harbour. A ſerjeant and three or four ſoldiers, a few black ſlaves, and two ruſty old pieces of ordnance, compoſe the whole of their eſtabliſhment. They have here two houſes; one of which, built entirely of wood, is their habitation; the other, formerly inhabited by their miſſionaries, ſerves now for a ſtorehouſe.

Theſe iſlands are in general woody, but contain likewiſe ſome portions of clear land. From the ſummits of their hills the proſpects are often beautiful and romantic. The ſoil is rich, and probably capable of producing all the various fruits and vegetables common to hot climates. The natural productions of this kind, which moſtly abound, are cocoa nuts, *papias*, plantains, limes, tamarinds, beetle nuts, and the *melóri*, a ſpecies of breadfruit; yams, and other roots are cultivated and thrive; but rice is here unknown. The *mangoſtain* tree, whoſe fruit is ſo juſtly extolled, grows wild; and pineapples of a delicious flavour are found in the woods.

Of all the Nicobar iſles Nancowry and Comerty are ſaid to be the beſt peopled; the population of both being ſuppoſed to amount to eight hundred. The natives of Nancowry and of the Nicobar iſlands in general, live in villages on the ſea-ſhore, and never erect their habitations inland (A). Their houſes are of a circular form, and are covered with elliptical domes, thatched with graſs

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(A) The great Nicobar iſland is perhaps an exception, where, it is ſaid, a race of men exiſts, who are totally different in their colour and manners. They are conſidered as the *Aborigines* of the country. They live in the interior parts among the mountains, and commit frequent depredations on the peaceable inhabitants of the coaſts.

graſs and the leaves of cocoa nut. They are raiſed upon piles to the height of ſix or eight feet above the ground; the floor and ſides are laid with planks, and the aſcent is by a ladder. In thoſe bays or inlets which are ſheltered from the ſurf, they erect them ſometimes ſo near the margin of the water as to admit the tide to flow under, and waſh away the ordure from below.

In front of their villages, and a little advanced in the water, they plant beacons of a great height, which they adorn with tufts made of graſs, or the bark of ſome tree. Theſe objects are diſcernible at a great diſtance, and are intended probably for landmarks; their houſes, which are overſhadowed by thick groves of cocoa nut trees, ſeldom being viſible from afar.

The Nicobareans, though indolent, are in general robuſt and well-limbed. Their features are ſomewhat like the Malays, and their colour is nearly ſimilar. The women are much inferior in ſtature to the men, but more active in all domeſtic affairs. Contrary to the cuſtom of other nations, the women ſhave the hair of their heads, or keep it cloſe cropt, which gives them an uncouth appearance, in the eyes of ſtrangers at leaſt.

The inhabitants of Nancowry perform, every year, a very extraordinary ceremony in honour of the dead. It is thus deſcribed by Lieutenant Colebrooke:

"On the anniverſary of this feſtival, if it can be ſo called, their houſes are decorated with garlands of flowers, fruits, and branches of trees. The people of each village aſſemble, dreſt in their beſt attire, at the principal houſe in the place, where they ſpend the day in a convivial manner; the men, ſitting apart from the women, ſmoke tobacco, and intoxicate themſelves; while the latter are nurſing their children, and employed in preparations for the mournful buſineſs of the night. At a certain hour of the afternoon, announced by ſtriking the *Goung*, the women ſet up the moſt diſmal howls and lamentations, which they continue without intermiſſion till about ſun-ſet; when the whole party get up, and walk in proceſſion to the burying-ground. Arrived at the place, they form a circle around one of the graves, when a ſtake, planted exactly over the head of the corpſe, is pulled up. The woman who is neareſt of kin to the deceaſed, ſteps out from the crowd, digs up the ſkull, and draws it up with her hands. At ſight of the bones, her ſtrength ſeems to fail her; ſhe ſhrieks, ſhe ſobs; and tears of anguiſh abundantly fall on the mouldering object of her pious care. She clears it from the earth, ſcrapes off the feſtering fleſh, and laves it plentifully with the milk of freſh cocoa-nuts, ſupplied by the byſtanders; after which ſhe rubs it over with an infuſion of ſaffron, and wraps it carefully in a piece of new cloth. It is then depoſited again in the earth, and covered up; the ſtake is replanted, and hung with the various trappings and implements belonging to the deceaſed. They proceed then to the other graves; and the whole night is ſpent in repetitions of theſe diſmal and diſguſtful rites.

"On the morning following, the ceremony is concluded by an offering of many fat ſwine; when the ſacrifice made to the dead affords an ample feaſt to the living: they beſmear themſelves with the blood of the ſlaughtered hogs, and ſome, more voracious than others, eat the fleſh raw. They have various ways, however, of dreſſing their meat, but always eat it without ſalt. A kind of paſte made of the *melóri*, ſerves them for bread; and they finiſh their repaſt with copious potations of *taury*, an inebriating liquor."

The Nicobareans are hoſpitable and honeſt, and are remarkable for a ſtrict obſervance of truth, and for punctuality in adhering to their engagements. Such crimes as theft, robbery, and murder, are unknown in theſe iſlands; but they do not want ſpirit to revenge their injuries, and will fight reſolutely, and ſlay their enemies, if attacked or unjuſtly dealt with. Their only vice, if this failing can be ſo called, is inebriation; but in their cups they are generally jovial and good-humoured. It ſometimes, however, happens at their feaſts, that the men of different villages fall out; and the quarrel immediately becomes general. In theſe caſes they terminate their differences in a pitched battle; where the only weapons uſed are long ſticks, of a hard and knotty wood. With theſe they drub one another moſt heartily, till, no longer able to endure the conflict, they mutually put a ſtop to the combat, and all get drunk again.

NANJEMY *River*, a ſhort creek which empties into the Patowmac in Charles county, Maryland, ſouthweſtward of Port Tobacco river.—*Morse.*

NANKAR, ancient allowance to zemindars in land or money.

NANKEEN, or NAN-KING, is a well-known cotton ſtuff, which derives its name from the ancient capital of China (See NAN-KING, *Encycl.*). It is, however, according to Van Braam, manufactured at a great diſtance from that city, in the diſtrict of *Fong-kiang-fou*, ſituated in the ſouth-eaſt of the province of *Kiang-nam* upon the ſea-ſhore. The colour of nankeen is natural, the down of which it is made being of the ſame yellow tinge with the cloth. The colour, as well as ſuperior quality of this cotton, ſeems to be derived from the ſoil; for it is ſaid that the ſeeds of the nankeen cotton degenerate in both particulars when tranſplanted to another province, however little different in its climate. The common opinion, that the colour of the ſtuff is given by a dye, occaſioned an order from Europe, ſome years ago, to dye the pieces of nankeen of a deeper colour than they had at that period; and the reaſon of their being then paler than formerly is as follows:

Shortly after the Americans began to trade with China, the demand increaſed to nearly double to quantity it was poſſible to furniſh. To ſupply this deficiency, the manufacturers mixed common white cotton with the brown; this gave it a pale caſt, which was immediately remarked; and for this lighter kind no purchaſer could be found, till the other was exhauſted. As the conſumption is grown leſs during the laſt three years, the mixture of cotton is no longer neceſſary, and nankeen is become what it was before. By keeping them two or three years, it even appears that they have the property of growing darker. This kind of ſtuff muſt be acknowledged to be the ſtrongeſt yet known. Many perſons have found that clothes made of it will laſt three or four years, although for ever in the waſh. This it is that makes them the favourite wear for breeches and waiſtcoats both in Europe and America. The white nankeen is of the ſame quality, and is made of white cotton as good as the brown, and which alſo grows in Kiang-nam.

NANSEMOND, a county of Virginia, on the S.

ſide of James's river, and W. of Norfolk county, on the N. Carolina line. It is about 44 miles in length, and 24 in breadth, and contains 9010 inhabitants, including 3,817 ſlaves.—*Morſe.*

Nanſemond, a ſhort river of Virginia, which riſes in Great Diſmal Swamp, and purſuing a N. then a N. E. direction, empties into James's river, a few miles W. of Elizabeth river. It is navigable to Sleepy Hole, for veſſels of 250 tons; to Suffolk, for thoſe of 100 tons; and to Milner's, for thoſe of 25 tons.—*ib.*

NANTASKET *Road*, may be conſidered as the entrance into the channels of Boſton harbour; lies S. of the light-houſe, near Rainsford or Hoſpital Iſland. A veſſel may anchor here in from 7 to 5 fathoms in ſafety. Two huts are erected here with accommodations for ſhipwrecked ſeamen.—*ib.*

NANTIKOKE, a navigable river of the eaſtern ſhore of Maryland, empties into the Cheſapeak Bay. —*ib.*

Nantikokes, an Indian nation who formerly lived in Maryland, upon the above river. They firſt retired to the Suſquehannah, and then farther north. They were ſkilled in the art of poiſoning; by which ſhocking art nearly their whole tribe was extirpated, as well as ſome of their neighbours. Theſe, with the Mohickons and Conoys, 20 years ago inhabited Utſanango, Chagnet and Owegy, on the E. branch of the Suſquehannah. The two firſt could at that period furniſh 100 warriors each; and the Conoys 30 warriors.—*ib.*

NANTMILL, *Eaſt* and *Weſt*, two townſhips in Cheſter county, Pennſylvania.—*ib.*

NANTUCKET *Iſland*, belonging to the State of Maſſachuſetts, is ſituated between lat. 41 13 and 41 22 30 N. and between 69 56 and 70 13 30 weſt long. and is about 8 leagues ſouthward of Cape Cod, and lies eaſtward of the iſland of Martha's Vineyard. It is 15 miles in length, and 11 in breadth, including Sandy Point; but its general breadth is 3½ miles. This is thought to be the iſland called *Nauticon* by ancient voyagers. There is but one bay of any note, and that is formed by a long ſandy point, extending from the E. end of the iſland to the N. and W. (on which ſtands a light-houſe, which was erected by the State in 1784) and on the north ſide of the iſland as far as Eel Point. This makes a fine road for ſhips, except with the wind at N. W. when there is a heavy ſwell. The harbour has a bar of ſand, on which are only 7½ feet of water at ebb tide, but within it has 12 and 14 feet. The iſland conſtitutes a county of its own name, and contains 4,620 inhabitants, and ſends one repreſentative to the general court. There is a duck manufactory here, and 10 ſpermaceti works. The inhabitants are, for the moſt part, a robuſt and enterpriſing ſet of people, moſtly ſeamen and mechanics. The ſeamen are the moſt expert whale-men in the world. The whale fiſhery originated among the white inhabitants in the year 1690, in boats from the ſhore. In 1715, they had 6 ſloops, 38 tons burden, and the fiſhery produced 1100l. ſterling. From 1772, to 1775, the fiſhery employed 150 ſail from 90 to 180 tons, upon the coaſt of Guinea, Brazil, and the Weſt-Indies; the produce of which amounted to 167,000l. ſterl. The late war almoſt ruined this buſineſs. They have ſince, however, revived it again, and purſue the whales even into the great Pacific Ocean. There is not here a ſingle tree of natural growth; they have a place called The Woods, but it has been deſtitute of trees for theſe 60 years paſt. The iſland had formerly plenty of wood. The people, eſpecially the females, are fondly attached to the iſland, and few wiſh to migrate to a more deſirable ſituation. The people are moſtly *Friends*, or Quakers. There is one ſociety of Congregationaliſts. Some part of the E. end of the iſland, known by the name of *Squam*, and ſome few other places, are held as private farms. At preſent, there are near 300 proprietors of the iſland. The proportional number of cattle, ſheep, &c. put out to paſture, and the quantity of ground to raiſe crops, are minutely regulated; and proper officers are appointed, who, in their books debit and credit the proprietors accordingly. In the month of June, each proprietor gives in to the clerks the number of his ſheep, cattle, and horſes, that he may be charged with them in the books; and if the number be more than he is entitled to by his rights, he hires ground of his neighbours who have leſs. But, if the proprietors all together have more than their number, the overplus are either killed or tranſported from the iſland.

In the year 1659, when Thomas Macy removed with his family from Saliſbury in Eſſex county, to the W. end of the iſland, with ſeveral other families, there were nearly 3,000 Indians on the iſland, who were kind to ſtrangers, and benevolent to each other, and lived happily until contaminated by the bad example of the whites, who introduced rum; and their number ſoon began to decreaſe. The whites had no material quarrel or difficulty with them. The natives ſold their lands, and the whites went on purchaſing till, in fine, they have obtained the whole, except ſome ſmall rights, which are ſtill retained by the natives. A mortal ſickneſs carried off 222 of them in 1764; and they are now reduced to 4 males, and 16 females.—*ib.*

Nantucket, (formerly *Sherburne*) a poſt-town, capital and port of entry in the above iſland. The exports in the year ending Sept. 30, 1794, amounted to 20,517 dollars. It is 60 miles S. E. of New-Bedford, 123 S. W. of Boſton, and 382 E. N. E. of Philadelphia.—*ib.*

Nantucket *Shoal*, a bank which ſtretches out above 15 leagues in length, and 6 in breadth, to the S. E. from the iſland of its name.—*ib.*

NANTUXET *Bay*, New-Jerſey, is on the eaſtern ſide of Delaware Bay, oppoſite Bombay Hook.—*ib.*

NAPLES-Yellow, called alſo *Neapolitan earth*, in Italian *Giallolino*, and in French *Jaune de Naples*, is a beautiful pigment, concerning which we have much information from the indefatigable Beckmann. "It has (ſays he) the appearance of an earth, is of a pale orange-yellow colour, ponderous, granulated, exceedingly friable, does not effloreſce, nor become moiſt when expoſed to the air, but when applied to the tongue ſeems to adhere to it. When reduced to a fine powder, it remains for ſome time ſuſpended in water, but ſoon depoſits itſelf at the bottom in the form of a ſlime. When boiled with water, the water, at leaſt ſometimes, is obſerved to have a ſomewhat ſaline taſte. It does not efferveſce with acids, but is in part diſſolved by aqua regia (nitro-muriatic acid). In the fire it emits no ſulphureous vapour, is difficult to be fuſed, and by that operation undergoes no material change, only that its colour becomes ſomewhat redder. When fuſed with colourleſs glaſs, it gives it a milk-white colour, a ſure proof that it contains no iron; and, with inflammable ſubſtances, there is obtained from it a regulus which has the appearance of a mixture of lead and antimony.

"This article is brought from Naples for the moſt part in the form of an earthy cruſt about three or four lines in thickneſs, and it ſometimes retains the form of the veſſel in which it has hardened. It can be procured alſo as a fine powder, as the colourmen keep it ſometimes ready pounded for uſe."

About the nature of the ſubſtance called Naples yellow there has been much diverſity of opinion. Moſt of thoſe who have written about it, conſider it as originating from fire, and as a volcanic production of Mount Veſuvius or Mount Ætna; others have pronounced it to be a natural ochre. Guettard thought it rather a kind of bole; but Pott approached neareſt the truth, by aſſerting it to be an artificial preparation*. Fougeroux is entitled to the merit of having proved this, and of having ſhewn the poſſibility of preparing it. According to his experiments, Naples yellow will be obtained, if you boil for ſeven or eight hours, firſt over a ſlow and then over a ſtrong fire, a mixture finely pulveriſed of twelve parts of pure white lead, one part of alum, one part of ſal ammoniac, and three parts of diaphoretic antimony† (white oxyd of antimony by nitre). But before Fougeroux, who may have obtained an account of the proceſs during his travels through Italy, a more certain proceſs was publiſhed in the year 1758, by Giambattiſta Paſſeri, in his intereſting work on the painting of earthen-ware‡. The articles to be employed, according to this author, are, "one pound of antimony, a pound and a half of lead, one ounce of *alume di feccia*, and the ſame quantity of common ſalt." I am inclined (ſays M. Beckmann) to think that this receipt was not unknown to Fougeroux, and that he conſidered *alume di feccia* to be alum. Profeſſor Leonhardi, a man of very ſound learning, has tranſlated this expreſſion by the word alum. I will, however, freely confeſs, that I conſider *alume di feccia* not to mean alum, but ſalt of tartar, or potaſh. Paſſeri ſays, that the proportions may be varied different ways; and he gives ſix other receipts, in which he does not mention *alume di feccia*, but only *feccia*; and this word certainly means *weinheſen* or wineſtone (tartar). Profeſſor Leonhardi himſelf ſeems to confirm this opinion, by ſaying, that Vairo, profeſſor of chemiſtry at Naples, has tranſlated "the aſhes of wine lees" (*cineres infectorii*) by the words *alume di feccia*.

After Fougeroux's paper was printed, De la Lande publiſhed a receipt which he had received from the well-known prince San Severo, and in which lead and antimony only are employed; but no mention is made either of alum, tartar, or any other ſalt. This receipt is as follows:

Take lead well calcined and ſifted, with a third part of its weight of antimony pounded and ſifted alſo. Mix theſe ſubſtances well together, and ſift them again through a piece of ſilk. Then take large flat earthen diſhes, not varniſhed, cover them with white paper, and ſpread out the powder upon them to the depth of about two inches. Place theſe diſhes in a potter's furnace, but only at the top, that they may not be expoſed to too violent a heat. The reverberation of the flame will be ſufficient. The diſhes may be taken out at the ſame time as the earthen-ware, and the ſubſtance will then be found hard, and of a yellow colour. It is then pounded on a piece of marble with water, and afterwards dried for uſe.

The enamel-painters in Germany prepare a yellow glazing, not very different from the real Naples yellow, by a preſcription, according to which, "one pound of antimony, ſix ounces of red lead, and two ounces of white ſand, are to be fuſed together. The produce, which appears quite black, is to be pounded, and then fuſed again; and this proceſs is to be repeated till the whole maſs becomes thoroughly yellow. Half a pound of this maſs is to be mixed with two ounces of red lead, and afterwards fuſed; and by this tedious proceſs an orange-yellow pigment will be obtained."

All artiſts who ſpeak of the uſe of Naples yellow, give cautions againſt applying iron to it, as the colour by theſe means becomes greeniſh, or at leaſt dirty. For this reaſon, it muſt be pounded on a ſtone, and ſcraped together with an ivory ſpatula. It is employed chiefly in oil painting, becauſe the colour is ſofter, brighter, and richer than that of ochre, yellow lead, or orpiment, and becauſe it far exceeds theſe pigments in durability. It is employed in particular when the yellow ought to have the appearance of gold, and in this reſpect it may be prepared with gum water, and uſed as a water colour. A ſtill greater advantage of it is, that it is proper for enamel painting, and on that account may be employed on porcelain or earthen ware (A). Profeſſor Beckmann, however, recommends to artiſts to examine whether the oxyd prepared from wolfram, by boiling in the muriatic acid, which has a beautiful yellow colour, might not be uſed in the ſame manner as Naples yellow.

NARDUS. Under this generic term we have, in the *Encyclopædia*, given, from the *Philoſophical Tranſactions*, a deſcription of the plant or graſs which Dr Blane conſiders as the ſpikenard of the ancients. It is our duty, in this place, to inform our readers, that Sir William Jones, in the 2d and 4th volumes of the *Aſiatic Reſearches*, ſeems to have completely proved that the ſpikenard of Dioſcorides and Galen, or *Nardus Indica*, was a very different plant from the Andropogon of Dr Blane, and that it grows in a country far diſtant from *Mackran*. The proofs brought by the illuſtrious preſident of the Aſiatic Society, in ſupport of his own opinion, are too numerous and circumſtantial to be introduced into ſuch a work as this. We ſhall therefore only give one of them; which though, when ſeparated from the reſt, it loſes much of its force, muſt be allowed, even ſingly, to have great weight.

The true Indian ſpikenard is confeſſedly called by the Arabs *Sumbulu'l Hind*; for ſo they tranſlate the name of it in Dioſcorides. Now (ſays Sir William) I put a fair and plain queſtion ſeverally to three or four Muſſulman phyſicians: "What is the Indian name of the plant which the Arabs call *Sumbulu'l Hind?*" They all anſwered, but ſome with more readineſs than others, *Játámansí*. After a pretty long interval, I

* *Lithogeognoſie*, v. ii. p. 15.

† *Mem. of the Acad. of Sciences*, 1766.

‡ *In Nuova raccolta d'opuſculi ſcientifici*, t. iv.

(A) In the Memoirs of the Academy of Sciences for 1767, Fougeroux has proved that the giallolino prepared by him produced on porcelain a much more beautiful colour than the Naples yellow ſold in the ſhops.

ſhewed them the ſpikes (as they are called) of *Játámansí*, and aſked, what was the Arabic name of that Indian drug? They all anſwered readily, *Sumbulu'l Hind.* The ſame evidence may be obtained in this country by any other European who ſeeks it; and if among twelve native phyſicians, verſed in Arabian and Indian philology, a ſingle man ſhould, after due conſideration, give different anſwers, I will cheerfully ſubmit to the Roman judgment of *non liquet*. But the *Játámansí** evidently belongs to the natural order which Linnæus calls *aggregate;* with the following *characters:*

* Plate XXX.

Calyx, ſcarce any; *margin*, hardly diſcernible. *Corolla*, one petal; *tube* ſomewhat gibbous; *border* five cleft. *Stamina*, three *Anthers*. *Piſtula*, *Germ* beneath; one *Style* erect. *Seed*, ſolitary, crowned with a pappus. *Root*, fibrous. *Leaves*, hearted, fourfold; *radical* leaves petioled.

It appears therefore (continues the learned author) to be the Protean plant Valerian, a ſiſter of the Mountain and Celtic Nard, and of a ſpecies which I ſhould deſcribe in the Linnean ſtyle, *Valeriana Játámansí floribus triandris, foliis cordatis quaternis, radicalibus petiolatis.* The radical leaves, riſing from the ground, and enfolding the young ſtem, are plucked up with a part of the root, and being dried in the ſun or by an artificial heat, are ſold as a drug, which, from its appearance, has been called ſpikenard. The Játámansí is a native of the moſt remote and hilly parts of India, ſuch as NE'PA'L, Marang Butan, near which Ptolemy fixes the native ſoil of the *Nardus Indica*. It grows erect above the ſurface of the ground, reſembling an ear of green wheat; and when recent, it has a faint odour, which is greatly increaſed by the ſimple proceſs of drying it.

Biog. Dict. new edit.

NARES (James), doctor of muſic, an eminent compoſer and teacher in that ſcience, under whom ſome of the firſt muſicians of the preſent day received the whole or part of their education, was the ſon of Mr Nares, who was, for many years, ſteward to Montague and Willoughby, earls of Abingdon. He was born, as well as his brother, the late Mr Juſtice Nares, at Stanwell in Middleſex; the former in 1715, the latter in 1716. His muſical education he commenced under Mr Gates, then maſter of the royal choriſters; and completed it under the celebrated Dr Pepuſch. Thus prepared, he officiated, for ſome time, as deputy to Mr Pigott, organiſt of Windſor; but on the reſignation of Mr Saliſbury, organiſt of York, in 1734, was choſen to ſucceed him, being then only nineteen. It is related, on undoubted authority, that, when the old muſician firſt ſaw his intended ſucceſſor, he ſaid, rather angrily, "What! is that child to ſucceed me?" which being mentioned to the organiſt-elect, he took an early opportunity, on a difficult ſervice being appointed, to play it throughout half a note below the pitch, which brought it into a key with ſeven ſharps; and went through it without the ſlighteſt error. Being aſked why he did ſo? he ſaid, that "he only wiſhed to ſhew Mr Saliſbury what a child could do." His knowledge in all branches of his profeſſion was equal to his practical ſkill in this inſtance; and, during his reſidence at York, where he was abundantly employed as a teacher, and where he married, Mr Nares, by his good conduct, as well as profeſſional merit, obtained many powerful friends. Among the foremoſt of theſe was Dr Fontayne, the reſpectable and venerable dean of York; who, when Dr Green died, towards the latter end of 1755, exerted his intereſt ſo ſucceſsfully, that he obtained for him the united places of organiſt and compoſer to his majeſty. He removed therefore to London in the beginning of 1756; and, about the ſame time, was created doctor in muſic at Cambridge.

On the reſignation of Mr Gates, in 1757, Dr Nares obtained alſo the place of maſter of the choriſters; which having been, for a long time, without increaſe, notwithſtanding the increaſe of expences attending it, was, by royal favour, augmented about 1775, firſt with the ſalary of the violiſt; and, on the revival of that place for Mr Croſdill, in 1777, with that of lutaniſt, which was annexed to it for ever. It was in this ſituation that Dr Nares ſuperintended the education of many pupils, who have ſince become famous; particularly Dr Arnold, who, though with him only for a ſhort time, was highly diſtinguiſhed by him for talents and application. The anthems and ſervices which Dr Nares produced, as compoſer to the royal chapel, were very numerous; many of them have ſince been printed, and many which exiſt only in manuſcript ſtill continue to be performed in the choirs with much effect. Having been originally a muſician rather by accident than choice, with very ſtrong talents and propenſities alſo for literature, Dr Nares was particularly attentive to expreſs the ſenſe of the words he undertook to ſet; and was the firſt who attempted to compoſe the Te Deum for the choir-ſervice, in ſuch a manner as to ſet off the ſentiments it contains to advantage. Before his time, it had been ſet rather to a regular ſtrain of chaunt than to any expreſſive melodies. The merits of Dr Nares were not overlooked by his royal patrons, whom he had occaſionally the honour to attend in private, though not a part of his regular duty. To manifeſt his reſpect and gratitude for them, he compoſed his dramatic ode, entitled The Royal Paſtoral, the words of which were written by Mr Bellamy, author of a book, entitled Ethic Amuſements.

In July 1780, Dr Nares was obliged, by declining health, to reſign the care of the choriſters, in which place he was ſucceeded by Dr Ayrton, his pupil and valued friend. In his ſixty-eighth year, a conſtitution, never robuſt, gave way, and he died on February 10. 1783. Teſtimony has been borne to the merits of Dr Nares by ſeveral writers, but more particularly by Mr Maſon, in his preface to a book of anthems, printed for the uſe of York Cathedral; and in his late Eſſays on Church Muſic, page 138. The late Lord Mornington, ſo well known for muſical talents, frequently conſulted him; and Sir John Hawkins derived advantage from his acquaintance, in the progreſs of his Hiſtory of Muſic. Throughout life, he was not leſs reſpected as a man than admired as a muſician; he had a vivacity that rendered his ſociety always pleaſing; and a generous contempt for every thing baſe, that manifeſted itſelf on all proper occaſions, and very juſtly commanded eſteem.

His printed works are theſe: 1. Eight Sets of Leſſons for the Harpſichord; dedicated to the Right Hon. Willoughby Earl of Abingdon. Printed in 1748; reprinted in 1757. 2. Five Leſſons for the Harpſichord, with a Sonata in ſcore for the Harpſichord or Organ; dedicated to the Right Honourable the Counteſs of

Carliſle; publiſhed in 1758 or 1759. 3. A Set of Eaſy Leſſons for the Harpſichord, three in number; with a dedication to the public, ſigned J. N. 4. A Treatiſe on Singing, ſmall ſize. 5. Il Principio; or A regular Introduction to playing on the Harpſichord or Organ. This was the firſt ſet of progreſſive leſſons publiſhed on a regular plan. 6. The Royal Paſtoral, a Dramatic Ode; dedicated to his Royal Highneſs the Prince of Wales; printed in ſcore, with an overture and choruſes. 7. Catches, Canons, and Glees; dedicated to the late Lord Mornington. 8. Six Fugues, with Introductory Voluntaries for the Organ or Harpſichord. 9. A Conciſe and Eaſy Treatiſe on Singing, with a Set of Engliſh Duets for Beginners. A different work from the former ſmall treatiſe. 10. Twenty Anthems, in ſcore, for one, two, three, four, and five Voices. Compoſed for the Uſe of his Majeſty's Chapels Royal, 1778. 11. Six Eaſy Anthems, with a favourite Morning and Evening Service, left for publication at his death, and publiſhed in 1788, with a portrait and a conciſe account of the author. Of theſe compoſitions the following ſhort character is given by an eminent muſician, to whom they are all well known: "The leſſons are compoſed in a maſterly and pleaſing ſtyle; free from thoſe tricks and unmeaning ſucceſſions of ſemitones, to which a good ear and ſound judgment never can be reconciled. The treatiſes on ſinging contain duets compoſed for the uſe of the children of the royal chapels, ſuperior to any thing yet publiſhed; and ſuch as every teacher ought to peruſe. His catches, canons, and glees, are natural and pleaſing; eſpecially the glee to all Lovers of Harmony, which gained the prize medal at the catch-club in 1770. The Royal Paſtoral is compoſed throughout in a very maſterly manner; particularly the choruſes, with which each part concludes. This ode, containing 108 pages, was written, and all the vocal and inſtrumental parts tranſcribed for performing, within twelve days. The ſix fugues, with introductory voluntaries for the organ, contain the ſtrongeſt proofs of ingenuity and judgment; few, if any, have ever been written that can be preferred to them. In both ſets of the anthems, the ſame characteriſtics appear; and the ſervice of the latter very juſtly acquired the title of *favourite;* nor can there be any doubt that the works of this author will be admired as long as a taſte for muſic ſhall ſubſiſt."

NARRAGANSET *Bay*, Rhode-Iſland, makes up from ſouth to north, between the main land on the eaſt and weſt. It emboſoms many fruitful and beautiful iſlands, the principal of which are Rhode-Iſland, Canonicut, Prudence, Patience, Hope, Dyers, and Hog Iſlands. The chief harbours are Newport, Wickford, Warren, Briſtol, and Greenwich, beſides Providence and Patuxet; the latter is near the mouth of Patuxet river, which falls into Providence river. Taunton river and many ſmaller ſtreams fall into this capacious bay. It affords fine fiſh, oyſters and lobſters in great plenty.—*Morse.*

NARRAGUAGUS *Bay.* A part of the bay between Goldſborough and Machias, in Waſhington county, Diſtrict of Maine, goes by this name. From thence for the ſpace of 60 or 70 miles, the navigator finds, within a great number of fine iſlands, a ſecure and pleaſant ſhip-way. Many of theſe iſlands are inhabited and make a fine appearance. A river of the ſame name falls into the bay.—*ib.*

NARRAGUAGUS, a poſt-town, ſituated on the above bay, 16 miles northeaſt of Goldſborough, 63 eaſt of Penobſcot, 9 from Pleaſant river, and 673 from Philadelphia.—*ib.*

NARROWS, *The.* The narrow paſſage from ſea, between Long and Staten Iſlands into the bay which ſpreads before New-York city, formed by the junction of Hudſon and Eaſt rivers, is thus called. This ſtrait is 9 miles ſouth of the city of New-York.—*ib.*

NARROWS, *The,* a ſtrait, about 3 miles broad, between the iſlands of Nevis and St Chriſtopher's Iſlands, in the Weſt-Indies.—*ib.*

NASH, a county of Halifax diſtrict, containing 7,393 inhabitants, of whom 2,009 are ſlaves. There is a large and valuable body of iron-ore in this county; but only one bloomery has yet been erected.—*ib.*

NASH *Court-Houſe*, in N. Carolina, where a poſt-office is kept, 28 miles from Tarborough, and as far from Lewiſburg.—*ib.*

NASHAUN, or *Nawſhawn*, one of the Elizabeth Iſles, the property of the Hon. James Bowdoin, Eſq. of Boſton, ſituated at the mouth of Buzzard's Bay, and 3 miles from the extremity of the peninſula of Barnſtable county. Conſiderable numbers of ſheep and cattle are ſupported upon this iſland; and it has become famous for its excellent wool and cheeſe. Here Capt. Bartholomew Goſnold landed in 1602, and took up his abode for ſome time.—*ib.*

NASHUA *River*, is a conſiderable ſtream in Worceſter county, Maſſachuſetts, and has rich intervale lands on its banks. It enters Merrimack river at Dunſtable. Its courſe is north-north-eaſt.—*ib.*

NASHVILLE, the chief town of Mero Diſtrict in the State of Tenneſſee, is pleaſantly ſituated in Davidſon county, on the ſouth bank of Cumberland river, where it is 200 yards broad. It was named after Brig. Gen. Francis Naſh, who fell on the 4th of Oct. 1777, in the battle of Germantown. It is regularly laid out, and contains 75 houſes, a court-houſe, an academy, and a church for Preſbyterians, and one for Methodiſts. It is the ſeat of the courts held ſemi-annually for the diſtrict of Mero, and of the courts of pleas and quarter ſeſſions for Davidſon county. It is 185 miles weſt of Knoxville, 66 from Big Salt Lick garriſon, 190 S. by W. of Lexington in Kentucky, 635 W. by S. of Richmond in Virginia, and 1015 W. S. W. of Philadelphia. N. lat. 36, W. long. 87 8.—*ib.*

NASKEAG *Point*, in Lincoln county, Diſtrict of Maine, is the eaſtern point of Penobſcot Bay.—*ib.*

NASSAU *Bay*, or *Spirito Santo*, is a large bay on the coaſt of Weſt-Florida, about 70 miles from north to ſouth. It has 4 iſlands on a line for 50 miles from S. W. to N. E. with openings between them a mile or two wide. The moſt northerly is called Myrtle Iſland, between which, and the continent, is the entrance of the bay. The bay is 15 miles broad from Myrtle Iſland to a row of iſlands running parallel with the main land, and another bay between them ſtretching 50 or 60 miles to the ſouth, as far as one of the ſmaller mouths of the Miſſiſſippi.—*ib.*

NASSAU *Bay*, an extenſive bay of the ocean, on the S. coaſt of Terra del Fuego iſland, at the S. extremity

mity of S. America. It is to the E. of Falſe Cape Horn, which forms the weſtern limit of the bay; Cape Horn being the S. point of the ſouthernmoſt of the Hermit's Iſlands, a groupe of iſlands which lie off the coaſt oppoſite to this bay. This bay is large and open, well ſheltered from the tempeſts of the ocean. It is capable of holding a fleet of ſhips, and though there are ſmall iſlands near its entrance, all the dangers are viſible, and ſhips may ſail freely between them, or on each ſide of them.—*ib.*

NASSAU *Cape*, on the coaſt of Surrinam, or N. E. coaſt of S. America, is to the N. N. W. of Eſſequibo gulf, and the E. point of the entrance into the river Pumaron. It is in about lat. 7. 40 N. and long. 59 30 W.—*ib.*

NASSAU *Cape*, on the N. ſhore of Terra Firma, S. America.—*ib.*

NASSAU, a ſmall town in Dauphin county, Pennſylvania. It contains a German church, and about 35 houſes. It is alſo called *Kempſtown.*—*ib.*

NASSAU *Iſland*, at the mouth of Byram river, in Long-Iſland Sound.—*ib.*

NASSAU *Road*, on the coaſt of Weſt-Florida, lies W. of Mobile Bay, 5 leagues to the northward of Ship Iſland, and within the north end of the Chandeleurs or Myrtle Iſlands. It is one of the beſt roads for large veſſels on the whole coaſt of Florida. It affords good ſhelter from winds that blow on ſhore, has no bar, and is eaſy of acceſs. Veſſels, however, muſt not go within $\frac{3}{4}$ of a mile of the inſide of the iſland, it being ſhoal near that diſtance from the ſhore. Veſſels may go round the north end of it from the ſea in $5\frac{1}{2}$ and 6 fathoms, at $\frac{1}{2}$ a mile from the ſhore, and afterwards muſt keep in $4\frac{1}{2}$ and 5 fathoms till the north point bears N. N. E. about 2 miles, where they can anchor in 4 fathoms good holding ground, ſheltered from eaſterly and ſoutherly winds: this is neceſſary for all veſſels frequenting the coaſt of Florida, as eaſterly winds are very frequent. There is freſh water to be got any where on the Chandeleurs by digging; and there is a kind of well at the north end, near an old hut. There is no wood to be found here but drift wood, of which there is great plenty along ſhore. Naſſau Road was firſt diſcovered by Dr Daniel Cox, of New-Jerſey, who named it ſo in honour of the reigning prince, William III. He alſo gave the name of Myrtle Iſlands to thoſe afterwards call Chandeleurs, by the French, from the candles made of the Myrtle wax, with which theſe iſlands abound.—*ib.*

NASSAU *River*, on the coaſt of Eaſt-Florida, has a bar generally about 8 feet water, but is ſubject to ſhifting. The tides are about 7 feet at low ſpring tides. An E. S. E. moon makes high water here, as alſo in moſt places along the coaſt.—*ib.*

NASSAU, the chief town of Providence Iſland, one of the Bahamas, and the ſeat of government. N. lat. 25 3. It is the only port of entry except at Turk's Iſland.—*ib.*

NATA, a town and bay in the province of Terra Firma, S. America. The bay of Nata lies on the S. coaſt of the Iſthmus of Darien, and on the North Pacific Ocean. From hence and the adjacent parts, proviſions are ſent for the ſupply of the inhabitants of Panama, which city is 67 miles N. E. of Nata. The bay is ſpacious and deep, but is not uſed by ſhips, but in caſes of neceſſity, as they are liable to be embayed by the winds that blow frequently at E. upon the ſhore. The bay extends to the iſland Iguenas. N. lat. 8 12, W. long. 81 12.—*ib.*

NATA POINT, or *Chama*, or *Chaumu Cape*, is at the W. point of the gulf of Panama, from whence the coaſt trends W. to Haguera Point 7 leagues. All ſhips bound to the N. W. and to Acapulco make this point. It is alſo called the S. point of the bay, which lies within on the W. ſide of this great Gulf of Panama.—*ib.*

NATACHQUOIN *River*, a large river of the coaſt of Labrador, in N. America, to the weſtward of Naſquirou river, under Mount Joli, where it forms a ſoutherly cape in lat. 50 25 N. and long. 60 45 W. The little Natachquoin is to the W. S. W. of this.—*ib.*

NATAL, a cape and town, on the S. ſhore of the Rio Grande, on the N. E. coaſt of Brazil in S. America, is to the S. W. of the 4 ſquare ſhoal, at the mouth of the entrance of that river, which contains ſome dangerous rocks. On this point is the Caſtle of the Three Kings, or Fortaleza des Tres Magos. The town of Natal is 3 leagues from the caſtle, before which is good anchorage for ſhips, in from 4 to 5 fathoms, and well ſecured from winds.—*ib.*

NATCHEZ, a powerful nation of Indians who formerly inhabited the country on the E. ſide of the Miſſiſſippi. Fort Roſalie is ſituated in the country which they poſſeſſed, in lat. 31 40. Nothing now remains of this nation but the name, by which the country continues to be called. The Creeks or Muſcogulges roſe upon the ruins of this nation. The French completed their deſtruction in 1730. The Natchez or Sun Set Indians, are a part of the Creek confederacy which they joined after they left Louiſiana.—*ib.*

NATCHITOCHES. A tract of country in Louiſiana, on the river Rouge, or Red river, bears this name. The French had a very conſiderable poſt on this river called Natchitoches. It was a frontier on the Spaniſh ſettlements, being 20 miles from the fort of Adayes, and 70 leagues from the confluence of the Rouge with the Miſſiſſippi.—*ib.*

NATICK, an ancient townſhip in Middleſex county, Maſſachuſetts, ſituated upon Charles river, 18 miles S. W. of Boſton, and 10 N. W. of Dedham. Its name in the Indian language ſignifies "The place of hills." The famous Mr Eliot formed a religious ſociety here; and in 1670, there were 50 Indian communicants. At his motion, the General Court granted the land in this town, containing about 6000 acres, to the Indians. Very few of their deſcendants, however, now remain. It was incorporated into an Engliſh diſtrict in 1761, and into a townſhip in 1781; and now contains 615 inhabitants.—*ib.*

NATEENAT, an Indian village on Nootka Sound, on the N. W. coaſt of N. America. It has a remarkable cataract, or water-fall, a few miles to the northward of it. N. lat. 48 40, W. long. from Greenwich 124 6.—*ib.*

NAUDOWESIES, an Indian nation inhabiting lands between Lakes Michigan and Superior. Warriors, 500.—*ib.*

NAUGATUCK *River*, a north-eaſtern branch of

Houſatonic river in Connecticut. A great number of mills and iron-works are upon this ſtream and its branches.—*ib.*

NAVIGATORS ISLANDS, an archipelago in the South Sea, diſcovered by Bougainville, who gave to them that name, becauſe the natives do not paſs between the different villages, which are all built in creeks and bays, but in their canoes. The Navigators Iſlands are ten in number; namely, *Opoun*, *Leoné*, *Fanfoué*, MAOUANA, *Oyolava*, *Calinaſſé*, *Pola*, *Shika*, *Oſſamo*, and *Ouera*.

We have already given an account of the ſoil and productions of MAOUANA; and as the other iſlands of this cluſter are equally fertile, we need not go over the ſame ground again. It may be proper, however, to obſerve, that in ſome of them the ſugar-cane was found growing ſpontaneouſly, though its juice contained leſs of the ſaccharine ſubſtance than the ſugar cane of the Weſt Indies, which our voyagers attributed to its growing in a richer ſoil and in the ſhade. According to Perouſe, the Navigators Iſlands are ſituated about the 14th degree of ſouth latitude, and between the 171ſt and 175th degrees of longitude weſt from Paris. In Oyolava the ſmoke was ſeen hovering over a village as over a large European town; and the number of canoes which from that iſland ſurrounded the frigates was immenſe. Theſe are very tickliſh veſſels, and would be abſolutely uſeleſs to any body but ſuch excellent ſwimmers as the iſlanders, who are no more ſurpriſed or uneaſy at their overſetting than we are at the fall of a hat. Taking up the canoe on their ſhoulders, they empty it of water, and then get in again, with the certainty of having the ſame operation to perform a ſecond time in half an hour. Sometimes they join two canoes together by means of a croſs piece of wood, in which they make a ſtep to receive the maſt; and in this way they are leſs liable to be overſet, ſometimes performing a long voyage without any ſuch accident. It is needleſs to add, that theſe canoes are very ſmall, generally containing only five or ſix perſons, though ſome few of them may contain as many as fourteen.

The natives of the Navigators Iſlands are tall and well made. Their uſual height is five feet nine, ten, and eleven inches; but their ſtature is leſs aſtoniſhing than the coloſſal proportions of the different parts of their bodies. "Our curioſity (ſays Perouſe), which often led us to meaſure them, gave them an opportunity of making frequent compariſons of their bodily ſtrength with ours. Theſe compariſons were not to our advantage; and we perhaps owe our misfortunes (ſee MAOUANA in this *Suppl.*) to the idea of individual ſuperiority reſulting from repeated trials. Their countenances often appeared to expreſs a ſentiment of diſdain, which I hoped to deſtroy, by ordering our arms to be uſed in their preſence: but my end could only have been gained by directing them againſt human victims; for otherwiſe they took the noiſe for ſport, and the trial for a diverſion.

"Among theſe Indians a very ſmall number is below the height indicated above. I have, however, meaſured ſeveral who were only five feet four inches, but theſe are the dwarfs of the country; and although their ſtature reſembles ours, their ſtrong and nervous arms, their broad cheſts, and their legs and thighs, are of a very different proportion.

"The men have the body painted or tatowed, ſo that any one would ſuppoſe them clad, although they go almoſt naked. They have only a girdle of ſea-weeds encircling their loins, which comes down to their knees, and gives them the appearance of the river gods of fabulous hiſtory, whom it is cuſtomary to depict with ruſhes round their waiſt. Their hair is very long. They often twiſt it round their heads, and thus add to their native ferocity of countenance, which always expreſſes either ſurpriſe or anger. The leaſt diſpute between them is followed by blows of ſticks, clubs, or paddles; and often, without doubt, coſts the combatants their lives. They are almoſt all covered with ſcars, which can only be the conſequence of their individual quarrels. The ſtature of the women is proportioned to that of the men. They are tall, ſlender, and not without grace; but they loſe, while yet in their prime, thoſe elegant forms, of which nature has not broken the mould among this barbarous race, but of which ſhe appears to leave them in poſſeſſion only for a moment, and with reluctance. Among a great number of women that I had an opportunity of ſeeing, I only obſerved three really pretty. The groſs effrontery of the reſt, the indecency of their motions, and the diſguſting offers which they made of their favours, rendered them fit mothers and wives for the ferocious beings that ſurrounded us." Our author gives the following inſtance of indecent manners, which is, perhaps, without a parallel.

The young and prettieſt females ſoon attracted the attention of ſeveral Frenchmen, who in ſpite of the Commodore's prohibition, endeavoured to form a connection with them, and were ſucceſsful. The looks of the Europeans expreſſing deſires which were ſoon divined, ſome old women undertook the negociation. The altar was prepared in the handſomeſt hut in the village, all the blinds were let down, and the inquiſitive were excluded. The victim was then laid in the arms of an old man, who exhorted her, during the ceremony, to moderate the expreſſion of her pain; while the matrons ſang and howled: the ceremony being performed in their preſence, and under the auſpices of the old man, who ſerved at once as prieſt and altar. All the women and children in the village were round the houſe, gently lifting up the blinds, and ſeeking to enjoy the ſight through the ſmalleſt crevices in the mats. Whatever former navigators may have ſaid, Perouſe was convinced that, in the Navigators Iſlands at leaſt, the young girls, before they are married, are miſtreſſes of their perſons, and that they are not diſhonoured by their complaiſance. It is even more than probable, that in marrying they are called to no account concerning their paſt conduct; but he had no doubt that they are obliged to be more reſerved when provided with a huſband.

Theſe people cultivate certain arts with ſucceſs. Under the article MAOUANA mention has been made of the elegant form which they give to their huts. It is not with ſuch folly as is commonly ſuppoſed that they diſdain our inſtruments of iron; for they finiſh their work very neatly with tools made of a very fine and compact ſpecies of baſaltes in the form of an adze. For a few glaſs beads they ſold to Perouſe large three-legged diſhes of a ſingle piece of wood, and ſo well poliſhed that they ſeemed to have been laid over with a coat of the fineſt varniſh. It would take an European workman ſeveral days to produce one of theſe diſhes, which, for want of proper inſtruments, muſt coſt an Indian ſeveral months labour. They ſet, however, ſcarcely any value upon them, becauſe they ſet little upon the time they employ. The fruit trees and nutritious roots that grow ſpontaneouſly around them, inſure to them their ſubſiſtence, as well as that of their hogs, dogs, and fowls; and if they ſometimes ſtoop to work, it is to procure enjoyments rather agreeable than uſeful. They manufacture very fine mats, and ſome paper ſtuffs. Our author remarked two or three of them, whom he took for chiefs, with a piece of cloth tied round their waiſt like a petticoat, inſtead of a girdle of weeds. It is compoſed of real thread, prepared no doubt from ſome filamentous plant like the nettle or flax; and is manufactured without a ſhuttle, the threads being abſolutely laid over one another like thoſe of their mats. This cloth, which has all the ſuppleneſs and ſolidity of ours, is very fit for the ſails of their canoes; and appeared far ſuperior to the paper ſtuff of the Society and Friendly Iſlands, which they manufacture alſo. Their canoes are well conſtructed, and furniſh a good proof of the ſkill with which they work in wood. For a few glaſs beads they gave to the Frenchmen, among other things, a wooden veſſel filled with cocoa nut oil, exactly of the ſhape of our earthen pots, and ſuch as no European would undertake to faſhion by any other means than a turning lathe. Their ropes are round, and twiſted like watch chains of ribbon: their mats are very fine; but their ſtuffs are inferior to thoſe of the Eaſter and Sandwich Iſlands.

Perouſe derives the natives of thoſe iſlands, whoſe colour, he ſays, nearly reſembles that of the Algerines and other nations on the coaſt of Barbary, from the Malays; and as we do not vouch for the truth of his theory, though we admit it to be ingenious, we ſhall give the reaſoning by which he ſupports it in his own words.

"We did not at firſt diſcover (ſays he) any identity between their language and that of the natives of the Society and Friendly Iſlands, of which we had vocabularies; but a more mature examination convinced us, that they ſpeak a dialect of the ſame language. A fact which tends to prove it, and which confirms the opinion of the Engliſh concerning the origin of theſe people, is, that a young domeſtic, a native of the province of Tagayan in the north of Manilla, underſtood and explained to us the greater part of their words. It is well known that the Tagayan, the Talgal, and the generality of languages ſpoken in the Philippines, are derived from the Malay: a language more diffuſed than were thoſe of the Greeks and Romans, and common to the numerous tribes that inhabit the iſlands of the great Pacific Ocean. It appears to me evident, that all theſe different nations are the progeny of Malay colonies, which, in ſome age extremely remote, conquered the iſlands they inhabit. I ſhould not even wonder, if the Chineſe and Egyptians, whoſe antiquity is ſo much vaunted, were mere moderns in compariſon of the Malays. But however this may be, I am ſatisfied that the aborigines of the Philippine Iſlands, Formoſa, New Guinea, New Britain, the New Hebrides, the Friendly Iſlands, &c. in the ſouthern hemiſphere, and thoſe of the Marianna and Sandwich iſlands in the northern, were that race of woolly headed men ſtill found in the interior of the iſlands of Luconia and Formoſa. They were not to be ſubjugated in New Guinea, New Britain, and the New Hebrides; but being overcome in the more eaſtern iſlands, which were too ſmall to afford them a retreat in the centre, they mixed with the conquering nation. Thence has reſulted a race of very black men, whoſe colour is ſtill ſeveral ſhades deeper than that of certain families of the country, probably becauſe the latter have made it a point of honour to keep their blood unmixed. I was ſtruck with theſe two very diſtinct races in the Iſlands of Navigators, and cannot attribute to them any other origin.

"The deſcendants of the Malays have acquired in theſe iſlands a degree of vigour and ſtrength, a lofty ſtature, and a Herculean form, which they do not inherit from their forefathers, but which they owe, without doubt to an abundance of food, to a mild climate, and to the influence of different phyſical cauſes which have been conſtantly acting during a long ſeries of generations. The arts which they perhaps brought with them may have been loſt for want of materials and inſtruments to practiſe them; but the identity of language, like Ariadne's clue, enables the obſerver to follow all the windings of this new labyrinth. The feudal government is alſo preſerved here: that government which little tyrants may regret; which was the diſgrace of Europe for ſeveral centuries; and of which the Gothic remains are ſtill to be found in our laws, and are the medals that atteſt our ancient barbariſm: that government, which is the moſt proper to keep up a ferocity of manners, becauſe the ſmalleſt diſputes occaſion wars of village againſt village, and becauſe wars of this nature are conducted without magnanimity, and without courage. Surpriſes and treachery are employed by turns; and in theſe unfortunate countries, inſtead of generous warriors, nothing is to be found but baſe aſſaſſins (A). The Malays are ſtill the moſt perfidious nation of Aſia: and their children have not degenerated, becauſe the ſame cauſes have led to and produced the ſame effects. It may be objected, perhaps, that it muſt have been very difficult for the Malays to make their way from weſt to eaſt, to arrive at theſe different iſlands;

(A) This was written under the old government of France by a man who, like other declaimers in the cauſe of liberty, forgot the excellencies, and inſiſted only on the defects of the feudal inſtitutions. Had Perouſe, however, returned to Europe, and witneſſed the *philoſophic* government of his country, he would have perceived, that *liberty* and *equality*, and *the rights of man*, are as well calculated to generate baſe aſſaſſins, as the Gothic remains of that government by which he ſuppoſed Europe to have been ſo long diſgraced. He might even have lived to regret, that his lot was not caſt among the bold and ferocious inhabitants of Maouana; for the treachery and cruelty of theſe people bears no proportion, even in his affecting narrative, to the ſyſtematic cruelty of thoſe who decreed, that the end ſanctifies the means, and that nothing, however atrocious in the eſtimation of antiquated moraliſts, is to be omitted, which contributes to elevate the mean above the noble.

iſlands; but the weſterly winds blow as frequently as the eaſterly in the vicinity of the equator, along a zone of ſeven or eight degrees from north to ſouth, where the wind is ſo variable, that it is hardly more difficult to navigate eaſt than weſt. Beſides, theſe different conqueſts may not have been effected at the ſame time: the people in queſtion may, on the contrary, have ſpread themſelves by little and little, and gradually have introduced that form of government which ſtill exiſts in the peninſula of Malacca, at Java, Sumatra, and at Borneo, as well as in all the other countries ſubject to that barbarous nation."

NAVARRE, a province of New-Mexico, on the N. E. ſide of the Gulf of California, which ſeparates it from the peninſula of California, on the S. W.—*Morse.*

NAVASIA, a ſmall iſland in the Windward Paſſage, or ſtrait between Cuba and Hiſpaniola in the Weſt-Indies. Thither the inhabitants of Jamaica come in boats to kill guaras, an amphibious creature that breeds plentifully at the roots of old trees. They are in the ſhape of a lizard, with ſcales, and ſome are 3 feet in length. Their fleſh is firm and white, and ſaid by ſeamen to make good broth.—*ib.*

NAVAZA, a ſmall barren iſland in the Weſt-Indies, not very high, is ſteep all round, and lies in lat. 18 20 N. It is 21 leagues W. S. W. ½ W. of the E. end of Jamaica, and 11 leagues from Tiburon, in the iſland of St Domingo.—*ib.*

NAVESINK *Harbour*, on the ſea-coaſt of Monmouth county, New-Jerſey, lies in lat. 40 24 N. having Jumping Point on the north, and is 2½ miles S. of the N. end of Sandy Hock iſland; and its mouth is 5 miles from the town of Shrewſbury. The ſmall river of its name falls into it from the W. and riſes in the ſame county. Naveſink Hills extend N. W. from the harbour on the Atlantic Ocean, to Rariton Bay; and are the firſt land diſcovered by mariners when they arrive on the coaſt. They are 600 feet above the level of the ſea, and may be ſeen 20 leagues off.—*ib.*

NAVIDAD, a town of Mechoacan a province of Mexico, with a harbour on the N. Pacific Ocean, is 156 miles W. of Mexico city. N. lat. 18 51, W. long. 111 10.—*ib.*

NAVIRES, or *Cas de Navires Bay*, in the iſland of Martinico, in the Weſt-Indies.—*ib.*

NAVY, a townſhip in Orleans county, in Vermont.—*ib.*

NAVY *Hall*, in Lower Canada, ſtands on the ſouth ſide of Lake Ontario, at the head and weſt ſide of Niagara river, which laſt ſeparates it from Fort Niagara, on the E. ſide, in the State of New-York. It is 20 miles N. by W. of Fort Erie, and 23 S. E. by S. of York.—*ib.*

NAVY *Iſland* lies in the middle of Niagara river, whoſe waters ſeparate it from Fort Sluſher, on the eaſt bank of the river, and the ſame waters divide it from Grand Iſland, on the S. and S. E. It is about one mile long, and one broad, and is about 13 miles N. by E. of Navy Hall.—*ib.*

NAZARETH, a beautiful town in Northampton county, Pennſylvania, inhabited by Moravians, or United Brethren. It is ſituated 10 miles north of Bethlehem, and 63 N. by W. of Philadelphia. It is a tract of good land, containing about 5,000 acres, purchaſed by the Rev. G. Whitfield, in 1740, and ſold 2 years after to the brethren. They were however obliged to leave this place the ſame year, where it ſeems they had made ſome ſettlements before. Biſhop Nitchman arrived from Europe this year (1740) with a company of brethren and ſiſters, and purchaſed and ſettled upon the ſpot which is now called Bethlehem. The town of Nazareth ſtands about the centre of the manor, on a ſmall creek which loſes itſelf in the earth about a mile and a half E. of the town. It was regularly laid out in 1772, and conſiſts of 2 principal ſtreets which croſs each other at right angles, and form a ſquare in the middle, of 340 by 200 feet. The largeſt building is a ſtone houſe, erected in 1755, named Nazareth Hall, 98 feet by 46 in length, and 54 in height. The lower floor is formed into a ſpacious hall for public worſhip, the upper part of the houſe is fitted up for a boarding ſchool, where youth, from different parts, are under the inſpection of the miniſter of the place and ſeveral tutors, and are inſtructed in the Engliſh, German, French and Latin languages; in hiſtory, geography, book-keeping, mathematics, muſic, drawing, and other ſciences. The front of the houſe faces a large ſquare open to the ſouth, adjoining a fine piece of meadow ground, and commands a moſt delightful proſpect. Another elegant building on the E. of Nazareth Hall is inhabited by the ſingle ſiſters, who have the ſame regulations and way of living as thoſe at Bethlehem. Beſides their principal manufactory for ſpinning and twiſting cotton, they have lately begun to draw wax tapers. At the ſouth-weſt corner of the aforeſaid ſquare, in the middle of the town, is the ſingle brethren's houſe, and on the E. S. E. corner a ſtore. On the ſouthernmoſt end of the ſtreet is a good tavern. The dwelling-houſes are, a few excepted, built of lime-ſtone, one or two ſtories high, inhabited by tradeſmen and mechanics, moſtly of German extraction. The inhabitants are ſupplied with water conveyed to them by pipes from a fine ſpring near the town. The ſituation of the town, and the ſalubrious air of the adjacent country, render this a very agreeable place. The number of inhabitants in the town and the farms belonging to it, (Shoeneck included) conſtituting one congregation, and meeting for divine ſervice on Lord's days and holidays, at Nazareth Hall, was in the year 1788, about 450.—*ib.*

NAZER, Nazr, Nezer, Nuzzer, Nuzzerana; a preſent from an inferior; fees of office.

NEBULOUS, or Cloudy, a term applied to certain fixed ſtars which ſhew a dim hazy light; being leſs than thoſe of the ſixth magnitude, and therefore ſcarcely viſible to the naked eye, to which at beſt they only appear like little duſky ſpecks or clouds. Through a moderate teleſcope, theſe nebulous ſtars plainly appear to be congeries or cluſters of ſeveral little ſtars.

NECESSITY, *Fort*, in Virginia, is ſituated in the Great Meadow, within 4 miles of the W. bounds of Maryland, and on the north ſide of the head water of Red Stone Creek, which empties from the E. into the Monongahela, in N. lat. 39 43, about 26 miles from the ſpot where this fort was erected. It is 238 miles E. by N. of Alexandria, and 258 north-weſt of Frederickſburgh. This ſpot will be forever famous in the hiſtory of America, as one of the firſt ſcenes of Gen. Washington's abilities as a commander. In 1753, it was only a ſmall unfiniſhed intrenchment, when Mr Waſhington, then a colonel, in the 22d year of his age, was ſent with 300 men towards the Ohio. An engagement with the enemy enſued, and the French were defeated. M. de Villier, the French commander, ſent down 900 men beſides Indians, to attack the Virginians. Their brave leader, however, made ſuch an able defence with his handful of men, in this unfiniſhed fort, as to conſtrain the French officer to grant him honourable terms of capitulation.—*Morse.*

NECKAR Isle, a ſmall barren iſland, or rather rock, diſcovered by Perouſe in the Pacific Ocean. Though its ſterility renders it of no importance in itſelf, its exact ſituation muſt be intereſting to navigators, who are therefore obliged to the French Commodore for having aſcertained its latitude to be 23° 34′ north, and its longitude to be 166° 52′ weſt from Paris. From the ſoundings the *Neckar* ſeemed to be only the top or nucleus of a much more conſiderable iſland, which, probably from being compoſed of a ſoft and diſſoluble ſubſtance, the ſea had gradually waſhed away. In proportion as the frigates left the ſhore, the depth, which at the diſtance of a mile was very little, gradually increaſed, till, at the diſtance of about ten miles, no bottom was found with a line of 150 fathoms; and over the whole of that ſhore the bottom conſiſted of coral and broken ſhells.

NEDDICK, *Cape*, or *Neddock*, lies between York river and Well's Bay on the coaſt of York county, Diſtrict of Maine.—*Morse.*

Neddick *River*, *Cape*, in the above county, is navigable about a mile from the ſea, and at full tide only for veſſels of any conſiderable burden, it having a bar of ſand at its mouth, and at an hour before and after low water, this rivulet is generally ſo ſhallow, as to be fordable within a few rods of the ſea.—*ib.*

NEEDHAM's *Point*, on the S. W. angle of the iſland of Barbadoes in the Weſt-Indies, is to the S. eaſterly from Bridgetown, having a fort upon it called Charles Fort.—*ib.*

Needham, a townſhip in Norfolk county, Maſſachuſetts, 11 miles from Boſton. It is about 9 miles in length and 5 in breadth, and is almoſt encompaſſed by Charles river. The lower fall of the river, at the bridge between Newton and Needham is about 20 feet in its direct deſcent. Here the river divides Middleſex from Norfolk county. It was incorporated in 1711, and contains 1130 inhabitants. A ſlitting and rolling mill has lately been erected here.—*ib.*

NEEHEEHEOU, one of the Sandwich iſlands, about 5 leagues to the weſtward of Atooi, and has about 10,000 inhabitants. Its place of anchorage is in lat. 21 50 N. and long. 160 15 W. Sometimes it is called *Neheeow*, or *Oneeheow*.—*ib.*

NEGADA, or *Anegada*, one of the Caribbee iſlands in the Weſt-Indies. It is low and deſart, encompaſſed with ſhoals and ſand-banks. It is called Negada, from its being moſtly overflown by high tides. It is 50 miles north-weſt of Anguilla, and abounds with crabs. N. lat. 18 6. W. long. 63 5.—*ib.*

NEGRIL *Harbour*, *North*, at the W. end of the iſland of Jamaica, has North Negril Point on the north, which is the moſt weſterly point of the iſland of Jamaica. N. lat. 18 45, W. long. 78.—*ib.*

NEGRO *Cape* and *Harbour*, at the ſouth-weſt extremity of Nova-Scotia.—*ib.*

Negro *Point*, on the E. coaſt of Brazil, is 3 leagues at S. S. E. from the Rio Grande, and 14 from Cape St Rocque.—*ib.*

Negro *River* is the weſtern boundary of Guiana in S. America.—*ib.*

Negro *Fort*, in Amazonia, ſtands on the north ſide of Amazon river in S. America, juſt below the junction of its great branches the Purus and Negro, in the 4th degree of north latitude, and about the 60th of W. longitude.—*ib.*

NELSON, a county of Kentucky, Chief town, Bairdſtown.—*ib.*

Nelson's *Fort*, a ſettlement on the W. ſhore of Hudſon's Bay, ſituated at the mouth of a river of the ſame name, 250 miles ſouth-eaſt of Churchill Fort, and 600 north-weſt of Rupert's Fort, in the poſſeſſion of the Hudſon's Bay Company. It is in lat. 57 12 north, and long. 92 42 weſt. The ſhoals ſo called are ſaid to be in lat. 57 35 north, and long. 92 12 weſt, and to have high water at full and change days at 20 minutes paſt 8 o'clock.—*ib.*

Nelson's *River* is the N. W. branch of Hayes river, on the W. ſhore of Hudſon's Bay, which is ſeparated into two channels by Hayes Iſland, at the mouth of which Nelſon's Fort is ſituated.—*ib.*

NENAWEWHCK *Indians* inhabit near Severn river, ſouth of Severn lake.—*ib.*

NEOMINAS *River*, on the coaſt of Peru, is 12 or 14 leagues to the N. W. of Bonaventura river. It is a large river, and empties into the ocean by 2 mouths. The ſhore is low, but there is no landing upon it, as it is inhabited only by ſavages whom it would not be very ſafe to truſt, as their peaceable or hoſtile diſpoſition towards Europeans cannot be eaſily known. The coaſt, though in the vicinity of the moſt flouriſhing Spaniſh colonies, remains unfrequented and wild. Palmas Iſland is oppoſite to this river, being low land, and having ſeveral ſhoals about it; and from hence to Cape Corientes is 20 leagues to the N. W. The river and iſland are in lat. about 4 30 N.—*ib.*

NEPAL, a kingdom of India, ſituated to the north-eaſt of the city of Patna, at the diſtance of ten or twelve days journey. Within the diſtance of four days journey from Nepal the road is good in the plains of Hindoſtan, but in the mountains it is bad, narrow, and dangerous. At the foot of the hills the country is called *Teriani*; and there the air is very unwholeſome from the middle of March to the middle of November; and people in their paſſage catch a diſorder called in the language of that country *aul*; which is a putrid fever, and of which the generality of people, who are attacked with it, die in a few days; but on the plains there is no apprehenſion of it. Although the road be very narrow and inconvenient for three or four days at the paſſes of the hills, where it is neceſſary to croſs and recroſs the river more than fifty times, yet, on reaching the interior mountain before you deſcend, you have an agreeable proſpect of the extenſive plain of Nepal, reſembling an amphitheatre covered with populous towns and villages: the circumference of the plain is about 200 miles, a little irregular, and ſurrounded by hills on all ſides, ſo that no perſon can enter or come out of it without paſſing the mountains.

There are three principal cities in the plain, each of which was the capital of an independent kingdom; the principal city of the three is ſituated to the northward of the plain, and is called *Cat'hmandu:* it contains about 18,000 houſes; and this kingdom, from ſouth to north, extends to the diſtance of twelve or thirteen days journey as far as the borders of Tibet, and is almoſt as extenſive from eaſt to weſt. The king of Cat'hmandu has always about 50,000 ſoldiers in his ſervice. The ſecond city to the ſouth-weſt of Cat'hmandu is called *Lelit Pattan;* it contains near 24,000 houſes. The third principal city to the eaſt of Lelit Pattan is called *B'hatgan:* it contains about 12,000 families; and is the metropolis of a diſtrict which extends towards the eaſt to the diſtance of five or ſix days journey; and borders upon another nation, alſo independent, called *Ciratas,* who profeſs no religion. Beſides theſe three principal cities, there are many other large and leſs conſiderable towns or fortreſſes; one of which is *Timi,* and another *Cipoli,* each of which contains about 8000 houſes, and is very populous. All thoſe towns, both great and ſmall, are well built; the houſes are conſtructed of brick, and are three or four ſtories high; their apartments are not lofty; they have doors and windows of wood well worked and arranged with great regularity. The ſtreets of all their towns are paved with brick or ſtone, with a regular declivity to carry off the water. In almoſt every ſtreet of the capital towns there are alſo good wells made of ſtone, from which the water paſſes through ſeveral ſtone canals for the public benefit. In every town there are large ſquare varandas well built, for the accommodation of travellers and the public: theſe varandas are called *Pali;* and there are alſo many of them, as well as wells, in different parts of the country for public uſe. There are alſo, on the outſide of the great towns, ſmall ſquare reſervoirs of water, faced with brick, with a good road to walk upon, and a large flight of ſteps for the convenience of thoſe who chooſe to bathe.

The religion of Nepal is of two kinds: the more ancient is profeſſed by many people who call themſelves *Baryeſu;* they pluck out all the hair from their heads; their dreſs is of coarſe red woollen cloth, and they wear a cap of the ſame: they are conſidered as people of the religious order, and their religion prohibits them from marrying, as it is with the Lamas of Tibet, from which country their religion was originally brought; but in Nepal they do not obſerve this rule, except at their diſcretion. They have large monaſteries, in which every one has a ſeparate apartment or place of abode. They obſerve alſo particular feſtivals, the principal of which is called *Yatra* in their language, and continues a month or longer according to the pleaſure of the king. The ceremony conſiſts in drawing an idol, which at Lelit Pattan is called *Baghero,* in a large and richly ornamented car, covered with gilt copper: round about the idol ſtand the king and the principal Baryeſus; and in this manner the vehicle is almoſt every day drawn thro' ſome one of the ſtreets of the city by the inhabitants, who run about beating and playing upon every kind of inſtrument their country affords, which make an inconceivable noiſe.

The other religion, the more common of the two, is that of the Brahmens, and is the ſame as is followed in Hindoſtan, with the difference that, in the latter country the Hindus being mixed with the Mahommedans, their religion alſo abounds with many prejudices, and is not ſtrictly obſerved; whereas in Nepal, where there are no Muſſelmans (except one Caſhmirian merchant), the Hindu religion is practiſed in its greateſt purity: every day of the month they claſs under its proper name, when certain ſacrifices are to be performed and certain prayers offered up in their temples: the places of worſhip are more in number in their towns than are to be found in the moſt populous and moſt flouriſhing cities of Chriſtendom; many of them are magnificent according to their ideas of architecture, and conſtructed at a very conſiderable expence; ſome of them have four or five ſquare cupolas, and in ſome of the temples two or three of the extreme cupolas, as well as the doors and windows of them, are decorated with gilt copper.

In the city of Lelit Pattan the temple of Baghero is more valuable, on account of the gold, ſilver, and jewels it contains, than even the houſe of the king. Beſides the large temples, there are alſo many ſmall ones, which have ſtairs, by which a ſingle perſon may aſcend, on the outſide all around them; and ſome of thoſe ſmall temples have four ſides, others ſix, with ſmall ſtone or marble pillars poliſhed very ſmooth, with two or three pyramidal ſtories, and all their ornaments well gilt, and neatly worked according to their ideas of taſte. On the outſide of ſome of their temples there are great ſquare pillars of ſingle ſtones from twenty to thirty feet high, upon which they place their idols ſuperbly gilt. The greateſt number of their temples have a good ſtone ſtaircaſe in the middle of the four ſquares, and at the end of each flight of ſtairs there are lines cut out of ſtone on both ſides: around about their temples there are alſo bells, which the people ring on particular occaſions; and when they are at prayers, many cupolas are alſo quite filled with little bells hanging by cords in the inſide about the diſtance of a foot from each other, which make a great noiſe on that quarter where the wind conveys the ſound. There are not only ſuperb temples in their great cities, but alſo within their caſtles.

To the eaſtward of Cat'hmandu, at the diſtance of about two or three miles, there is a place called *Tolu,* by which there flows a ſmall river, the water of which is eſteemed holy, according to their ſuperſtitious ideas, and thither they carry people of high rank, when they are thought to be at the point of death: at this place there is a temple, which is not inferior to the beſt and richeſt in any of the capital cities. They alſo have it on tradition, that at two or three places in Nepal valuable treaſures are concealed under ground: one of thoſe places they believe is Tolu; but no one is permitted to make uſe of them except the king, and that only in caſes of neceſſity. Thoſe treaſures, they ſay, have been accumulated in this manner: When any temple had become very rich from the offerings of the people, it was deſtroyed, and deep vaults dug under ground one above another, in which the gold, ſilver, gilt copper, jewels, and every thing of value, were depoſited. This was found to be actually the caſe when the miſſionary, from whoſe memoir this account of Nepal is taken, was at Cat'hmandu. One of the kings, or pretenders to the crown, who were then at war with each other, being in the utmoſt diſtreſs for want of money to pay his troops, ordered the vaults at Tolu to be opened; and found in the firſt vault more money, beſides ſilver and gold idols, than he had immediate occaſion for.

To the weſtward alſo of the great city of Lelit Pattan, at the diſtance of only three miles, is a caſtle called *Banga*, in which there is a magnificent temple. No one of the miſſionaries ever entered into this caſtle; becauſe the people who have the care of it, have ſuch a ſcrupulous veneration for the temple, that no perſon is permitted to enter it with his ſhoes on; and the miſſionaries, unwilling to ſhew ſuch reſpect to their falſe deities, never entered it. The author of this memoir, however, who acted as phyſician to the commandant, was of courſe admitted within the caſtle, and got a ſight of the celebrated temple, which he declares, that for magnificence he believes ſuperior to every thing in Europe.

Beſides the magnificence of the temples, which their cities and towns contain, there are many other rarities. At Cat'hmandu, on one ſide of the royal garden, there is a large fountain, in which is one of their idols called *Narayan*. This idol is of blue ſtone, crowned and ſleeping on a mattraſs alſo of the ſame kind of ſtone, and the idol and the mattraſs appear as floating upon the water. This ſtone machine is very large, being about 18 or 20 feet long, and broad in proportion, but well worked, and in good repair.

In a wall of the royal palace of Cat'hmandu, which is built upon the court before the palace, there is a great ſtone of a ſingle piece, which is about fifteen feet long, and four or five feet thick; on the top of this great ſtone there are four ſquare holes at equal diſtances from each other; in the inſide of the wall they pour water into the holes; and in the court ſide, each hole having a cloſed canal, every perſon may draw water to drink. At the foot of the ſtone is a large ladder, by which people aſcend to drink; but the curioſity of the ſtone conſiſts in its being quite covered with characters of different languages cut upon it. Some lines contain the characters of the language of the country, others the characters of Tibet, others Perſian, others Greek, beſides ſeveral others of different nations; and in the middle there is a line of Roman characters, which appears in this form, AVTOMNEW INTER LHIVERT; but none of the inhabitants have any knowledge how they came there, nor do they know whether or not any European had ever been in Nepal before the miſſionaries, who arrived there only the beginning of the eighteenth century. They are manifeſtly two French names of ſeaſons, with an Engliſh word between them.

There is alſo to the northward of the city of Cat'hmandu a hill called *Simbi*, upon which are ſome tombs of the Lamas of Tibet, and other people of high rank of the ſame nation. The monuments are conſtructed after various forms: two or three of them are pyramidal, very high, and well ornamented; ſo that they have a very good appearance, and may be ſeen at a conſiderable diſtance. Round theſe monuments are remarkable ſtones covered with characters, which probably are the inſcriptions of ſome of the inhabitants of Tibet whoſe bones were interred there. The natives of Nepal not only look upon the hill as ſacred, but imagine it is protected by their idols; and from this erroneous ſuppoſition never think of ſtationing troops there for the defence of it, although it be a poſt of great importance, and only at a ſhort mile's diſtance from the city. During the hoſtilities, however, which prevailed when our author was in the country, this ſacred hill was fortified by one of the armies, who, in digging their ditches among the tombs, found conſiderable pieces of gold, with a quantity of which metal the corpſes of the grandees of Tibet are always interred.

The kingdom of Nepal our author believes to be very ancient, becauſe it has always preſerved its peculiar language and independence. It was completely ruined, however, about thirty or forty years ago by the diſſenſions of its nobles, who, on the death of their ſovereign, and, as it would ſeem, the extinction of the royal line, could not agree in their choice of a proper ſucceſſor. The conſequence was, that different ſovereigns were ſet up by the nobles of different diſtricts; and theſe waged war with each other, with a degree of treachery and ſavage atrocity that has hardly a parallel in the annals of the world. Even the Brahmens, whom we are accuſtomed to conſider as a mild and innocent people, were, in the civil wars of Nepal, guilty of the meaneſt and baſeſt villanies: they brought about treaties between the rival ſovereigns, and then encouraged him whom they favoured, to maſſacre the adherents of the other in cold blood.

NEPEAN *Iſland*, a ſmall iſland of the South Pacific Ocean, oppoſite to Port Hunter on the ſouth coaſt of Norfolk Iſland.—*Morſe*.

NEPEAN *Sound*, an extenſive water on the north-weſt coaſt of N. America, having a number of iſlands in it, in ſome charts called Princeſs Royal Iſlands. It opens eaſtward from Cape St James, the ſouthernmoſt point of Waſhington's or Queen Charlotte's Iſlands. Fitzhugh's Sound lies between it and Queen Charlotte's Sound to the ſouthward.—*ib*.

NEPONSET, a river of Maſſachuſetts, originates chiefly from Muddy and Punkapog Ponds, in Stoughton, and Maſhapog Pond in Sharon, and after paſſing over falls ſufficient to carry mills, unites with other ſmall ſtreams, and forms a very conſtant ſupply of water, for the many mills ſituated on the river below, until it meets the tide in Milton, from whence it is navigable for veſſels of 150 tons burden to Boſton Bay, diſtant about 4 miles. There are 6 paper-mills, beſides many others of different kinds, on this ſmall river.—*ib*.

NERUKA, a port in the iſland of Cape Breton, where the French had a ſettlement.—*ib*.

NESBIT's *Harbour*, on the coaſt of New-Britain, in N. America, where the Moravians formed a ſettlement in 1752; of the firſt party ſome were killed, and others were driven away. In 1764, they made another attempt under the protection of the Britiſh government, and were well received by the Eſquimaux, and by the laſt account the miſſion ſucceeded.—*ib*.

NESCOPECK *River* falls into the N. E. branch of Suſquehannah river, near the mouth of the creek of that name, in Northumberland county, Pennſylvania, and oppoſite to the town of Berwick, 160 miles N. W. of Philadelphia, and in lat. 41 3. An Indian town, called Neſcopeck, formerly ſtood near the ſcite of Berwick.—*ib*.

NETHERLANDS, *New*, is the tract now included in the States of New York, New-Jerſey, and part of Delaware and Pennſylvania, and was thus named by the Dutch. It paſſed firſt by conqueſt and afterwards by treaty into the hands of the Engliſh.—*ib*.

NEUS, a river of N. Carolina, which empties into
Pamlico

Pamlico Sound below the town of Newbern. It is navigable for ſea veſſels 12 miles above Newbern; for ſcows 50 miles, and for ſmall boats 200 miles.—*ib.*

NEUSTRA *Sennora*, *Baia de*, or *Our Lady's Bay*, on the coaſt of Chili, on the S. Pacific Ocean, in S. America, is 30 leagues from Copiapa, and 20 S. S. W. of Cape George. It is indifferent riding in this bay, as the N. W. winds blow right in, and the guſts from the mountains are very dangerous.—*ib.*

NEVERSINK *Creek*, a ſtream in the Hardenbergh Patent, in Ulſter county, New-York. On an iſland in this creek Mr Baker having cut down a hollow beech tree, in March, 1790, found near two barrels full of chimney ſwallows in the cavity of the tree. They were in a torpid ſtate, but ſome of them being placed near a fire, were preſently reanimated by the warmth, and took wing with their uſual agility.—*ib.*

NEVIL *Bay*, on the weſt ſhore of Hudſon's bay, is nearly due weſt a little northerly from Cape Digges and Manſel iſland at the entrance into the bay. North lat. 62 30, weſt long. 95.—*ib.*

NEVIS, an iſland leſs than a league ſouth-eaſterly of the peninſula of St Chriſtopher's, one of the Caribbees. This beautiful little ſpot is nothing more than a ſingle mountain riſing like a cone in an eaſy aſcent from the ſea; the circumference of its baſe not exceeding 8 Britiſh leagues. This iſland was doubtleſs produced by ſome volcanic eruption, for there is a hollow crater near the ſummit ſtill viſible; which contains a hot ſpring, ſtrongly impregnated with ſulphur, and ſulphur is frequently found in ſubſtance, in the neighbouring gullies and cavities of the earth. The iſland is well watered, and the land in general fertile. Four thouſand acres of canes are annually cut, which produce an equal number of hogſheads of ſugar. The iſland, ſmall as it is, is divided into 5 pariſhes. It has one town, *Charleſtown*, which is a port of entry, and the ſeat of government; where is alſo a fort called Charles Fort. There are two other ſhipping places, viz. Indian Caſtle and New-Caſtle. Nevis contains 600 whites and 10,000 blacks. It was firſt ſettled by the Engliſh in 1628, under the protection of Sir Thomas Warner. It is ſaid, that, about the year 1640 the iſland contained 4,000 whites, and ſome writers ſay that before the year 1688 it had 30,000 inhabitants. The invaſion of the French about that time, and ſome epidemic diſorders ſtrangely diminiſhed the number. Charleſtown, the capital, lies in lat. 17 15 N. and long. 62 35 W. There are ſeveral rocks and ſhoals on the coaſt, particularly on the ſouth-weſt ſide, but ſhips ride between them in tolerable ſafety, the hurricane ſeaſons excepted, when they are obliged to put off to ſea, and run into Antigua, if poſſible.—*ib.*

NEW-ALBION, a name given to a country of indefinite limits, on the weſtern coaſt of N. America, lying north of *California*.—*ib.*

NEW, a river of N. Carolina, which empties, after a ſhort courſe, into the ocean, through New River Inlet. Its mouth is wide and ſhoal. It abounds with mullet during the winter ſeaſon.—*ib.*

NEW-ANDALUSIA, a province of Terra Firma, S. America, lying on the coaſt of the North Sea, oppoſite to the Leeward Iſlands; bounded by the river Oroonoko on the weſt. This country is called Paria by ſome writers. Its chief town is St Thomas. Some gold mines were diſcovered here in 1785.—*ib.*

NEW-ANDOVER, a ſettlement in York county, Diſtrict of Maine, which contains, including Hiram and Potterfield, 214 inhabitants.—*ib.*

NEW-ANTICARIA, a town of New-Spain, 34 leagues northward of Acapulco.—*ib.*

NEW-ANTIGUERA, an epiſcopal city of New-Spain, in the province of Guaxaca, erected into a biſhoprick by Paul III. 1547. It has a noble cathedral, ſupported by marble pillars.—*ib.*

NEWARK, a townſhip in Eſſex county, in Vermont.—*ib.*

NEWARK *Bay*, in New-Jerſey, is formed by the confluence of Paſſaick and Hackenſack rivers from the north, and is ſeparated from that part of North river oppoſite to New-York city, by Bergen Neck on the E. which neck, alſo, with Staten Iſland on the S. of it, form a narrow channel from the bay to North river eaſtward. Newark Bay alſo communicates with Rariton Bay, at the mouth of Rariton river, by a channel in a S. by W. direction along the weſtern ſide of Staten Iſland. The water paſſage from New-York to Elizabeth-Town Point, 15 miles, is through this bay.—*ib.*

NEWARK, a poſt-town of New-Jerſey and capital of Eſſex county, is pleaſantly ſituated at a ſmall diſtance weſt of Paſſaick river, near its mouth in Newark Bay, and nine miles weſt of New-York city. It is a handſome and flouriſhing town, celebrated for the excellence of its cyder, and is the ſeat of the largeſt ſhoe manufacture in the State: the average number made daily throughout the year, is eſtimated at about 200 pairs. The town is of much the ſame ſize as Elizabeth-Town, and is 6 miles N. of it. There is a Preſbyterian church of ſtone, the largeſt and moſt elegant building of the kind in the State. Beſides theſe is an Epiſcopal church, a court-houſe and gaol. The academy, which was eſtabliſhed here in June, 1792, promiſes to be a uſeful inſtitution. In Newark and in Orange which joins it on the N. W. there are 9 tanneries, and valuable quarries of ſtone for building. The quarries in Newark, would rent, it is ſaid, for £1000 a year, and the number of workmen limited. This town was originally ſettled by emigrants from Brandford, Connecticut, as long ago as 1662.—*ib.*

NEWARK, a village in Newcaſtle county, Delaware, ſituated between Chriſtiana and White Clay Creeks, 9 miles weſt of New-Caſtle, and 10 ſouth-weſterly of Wilmington.—*ib.*

NEWARK, a town lately laid out by the Britiſh in Upper Canada, on the river which connects Lakes Erie and Ontario, directly oppoſite Niagara town and fort.—*ib.*

NEW-ATHENS, or *Tioga Point*, ſtands on the poſt-road from Cooperſtown to Williamſburgh, in Luzerne county, Pennſylvania, on the point of land formed by the confluence of Tioga river with the E. branch of Suſquehannah river, in lat. 41 54 and long. 76 32 W. and about 3 miles S. of the New-York line; 20 miles S. E. by E. of Newtown in New-York, 14 S. W. of Owego, and 116 S. W. of Cooperſtown.—*ib.*

NEW-BARBADOES, a townſhip in Bergen county, New-Jerſey.—*ib.*

NEW-BEDFORD, a poſt-town and port of entry in Briſtol county, Maſſachuſetts, ſituated on a ſmall bay which ſets up north from Buzzard's Bay, 58 miles S. of Boſton. The townſhip was incorporated in 1787, and is 13 miles in length and 4 in breadth; bounded E. by Rocheſter, W. by Dartmouth, of which it was originally a part, and S. by Buzzard's Bay. *Acchuſnutt* was the Indian name of New-Bedford; and the ſmall river of that name, diſcovered by Goſnold in 1602, runs from north to ſouth through the townſhip, and divides the villages of Oxford and Fairhaven from Bedford village. A company was incorporated in 1796, for building a bridge acroſs this river. From the head to the mouth of the river is 7 or 8 miles. Fairhaven and Bedford villages are a mile apart, and a ferry conſtantly attended is eſtabliſhed between them. The harbour is very ſafe, in ſome places 17 or 18 feet of water; and veſſels of 3 or 400 tons lie at the wharves. Its mouth is formed by Clark's Neck on the W. ſide, and Sconticutt Point on the other. An iſland between theſe points renders the entrance narrow; in 5 fathoms water. High water at full and change of the moon 37 minutes after 7 o'clock. Dartmouth is the ſafeſt place to lie at with an eaſterly wind; but at New-Bedford you will lie ſafe at the wharves. The river has plenty of ſmall fiſh, and a ſhort way from its mouth they catch cod, baſs, black fiſh, ſheeps head, &c. The damage done by the Britiſh to this town in 1778 amounted to the value of £97,000. It is now in a flouriſhing ſtate. In the townſhip are a poſt-office, a printing-office, 3 meetings for Friends, and 3 for Congregationaliſts, and 3313 inhabitants. The exports to the different States and to the Weſt-Indies for one year, ending September 30, 1794, amounted to 82,085 dollars. It is 357 miles N. E. by E. of Philadelphia.—*ib.*

NEWBERN, one of the eaſtern maritime diſtricts of N. Carolina, bounded E. and S. E. by the Atlantic, S. W. by Wilmington, W. by Fayette, N. W. by Hillſborough, N. by Halifax, and N. E. by Edenton diſtrict. It comprehends the counties of Carteret, Jones, Craven, Beaufort, Hyde, Pitt, Wayne, Glaſgow, Lenoir, and Johnſton; and contains 55,540 inhabitants, including 15,900 ſlaves.—*ib.*

Newbern, the capital of the above diſtrict, is a poſt-town and port of entry, ſituated in Craven county, on a flat, ſandy point of land, formed by the confluence of the rivers Neus on the N. and Trent on the ſouth. Oppoſite to the town, the Neus is about a mile and a half, and the Trent three-quarters of a mile wide. Newbern is the largeſt town in the State, contains about 400 houſes, all built of wood except the palace, the church, the gaol, and two dwelling-houſes, which are of brick. The palace was erected by the province before the revolution, and was formerly the reſidence of the governors. It is large and elegant, two ſtories high, with two wings for offices, a little advanced in front towards the town; theſe wings are connected with the principal building by a circular arcade. It is much out of repair; and the only uſe to which this once handſome and well furniſhed building is now applied, is for ſchools. One of the halls is uſed for a ſchool, and another for a dancing-room. The arms of the king of Great-Britain ſtill appear in a pediment in front of the building. The Epiſcopalian church is a ſmall brick building, with a bell. It is the only houſe for public worſhip in the place. The court-houſe is raiſed on brick arches, ſo as to render the lower part a convenient market place; but the principal marketing is done with the people in their canoes and boats at the river ſide. In September, 1791, near one-third of this town was conſumed by fire. It carries on a conſiderable trade to the Weſt-Indies and the different States in tar, pitch, turpentine, lumber, corn, &c. The exports in 1794 amounted to 69,615 dollars. It is 149 miles from Raleigh, 99 S. W. of Edenton, 103 N. E. by N. of Wilmington, 238 S. of Peterſburgh in Virginia, and 501 S. W. of Philadelphia. N. lat. 35 20, W. long. 77 25. —*ib.*

NEW-BISCAY, a province in the audience of Galicia, in Old-Mexico or New-Spain. It is ſaid to be 100 leagues from E. to W. and 120 from north to ſouth. It is a well watered and fertile country. Many of the inhabitants are rich, not only in corn, cattle, &c. but alſo in ſilver mines, and ſome of lead.—*ib.*

NEW-BOSTON, a townſhip in Hillſborough county, New-Hampſhire, about 70 miles weſterly of Portſmouth. It was incorporated in 1763, and contains 1202 inhabitants.—*ib.*

NEW-BRAINTREE, a townſhip in Worceſter county, Maſſachuſetts, conſiſting of about 13,000 acres of land, taken from Braintree, Brookfield, and Hardwick, and was incorporated in 1751. It contains 940 inhabitants, moſtly farmers, and lies 19 miles north-weſt of Worceſter, and 66 north-weſt of Boſton. —*ib.*

NEW-BRITAIN, a townſhip in Buck's county, Pennſylvania.—*ib.*

NEW-BRUNSWICK, in the State of New-York is ſituated on Paltz Kill, about 8 miles S. W. of New-Paltz, and 69 north-weſterly of New-York city.—*ib.*

New-Brunswick, a Britiſh province in N. America, the north-weſt part of Nova-Scotia; bounded weſt by the Diſtrict of Maine, from which it is ſeparated by the river St Croix, and a line drawn due north from its ſource to the Canada line; north by the ſouthern boundary of the province of Lower Canada, until it touches the ſea-ſhore at the weſtern extremity of Chaleur Bay; then following the various windings of the ſea-ſhore to the Bay of Verte, in the ſtraits of Northumberland; on the S. E. it is divided from Nova-Scotia by the ſeveral windings of the Miſſiquaſh river, from its confluence with Beau Baſon (at the head of Chegnecto channel) to its main ſource; and from thence by a due eaſt line to the Bay of Verte. The northern ſhores of the Bay of Fundy conſtitute the remainder of the ſouthern boundary. All iſlands included in the above limits belong to this province. According to Arrowſmith's map, it extends from lat. 45 7 to 47 15 N. and from long. 64 to 69 50 W. It is about 260 miles long and 170 broad. The chief towns are St John's, at the mouth of the river of the ſame name; St Annes, the preſent ſeat of government, 80 miles up the river; and Frederickstown, a few miles above St Annes. The chief rivers are St John's, Merrimichi, Petitcodiac, Memramcook, Riſtigouche, and Nipiſiguit. The coaſt of this province is indented with numerous bays and commodious harbours; the chief are Chaleur, Merrimichi, Verte, which laſt is ſeparated from the Bay of Fundy by a narrow iſthmus of about 18 miles wide; Bay of Fundy, which extends 50 leagues into the country; Chegnecto Bay, at the head of the Bay of Fundy; Paſſamaquoddy Bay, bordering upon the Diſtrict of Maine. At the entrance of this bay is an iſland granted to ſeveral gentlemen in Liverpool, in Lancaſhire, who named it Campo Bello. At a very conſiderable expenſe they attempted to form a ſettlement here, but failed. On ſeveral other iſlands in this bay there are ſettlements made by people from Maſſachuſetts. Here are numerous lakes, as yet without names. Grand Lake, near St John's river, is 30 miles long and 8 or 10 broad; and in ſome places 40 fathoms deep.—*ib.*

NEWBERGH, a townſhip in Ulſter county, New-York, bounded eaſterly by Hudſon's river, and ſoutherly by New-Windſor, and contains 2365 inhabitants; of whom 373 are electors, and 57 ſlaves. The compact part of the town is neatly built, and pleaſantly ſituated on the weſt bank of the Hudſon, 66 miles north of New-York, oppoſite Fiſh-Kill Landing, 7 miles from Fiſh-Kill, 13 from Goſhen, and 14 ſouth from Poughkeepſie. It conſiſts of between 50 and 60 houſes and a Preſbyterian church, ſituated on a gentle aſcent from the river. The country northward is well cultivated, and affords a rich proſpect. Veſſels of conſiderable burden may load and unload at the wharves, and a number of veſſels are built annually at this buſy and thriving place.—*ib.*

NEWBURY, a county of Ninety-Six diſtrict, S. Carolina, which contains 9,342 inhabitants, of whom 1,144 are ſlaves. Newbury court-houſe is 45 miles from Columbia, and 32 from Laurens court-houſe. —*ib.*

NEWBURY, a townſhip in York county, Pennſylvania. —*ib.*

NEWBURY, the capital of Orange county, Vermont, pleaſantly ſituated on the weſt ſide of Connecticut river, oppoſite to Haverhill, in Grafton county, New-Hampſhire, and from which it is 5 miles diſtant. It contains about 50 houſes, a gaol, a court-houſe, and a handſome church for Congregationaliſts with a ſteeple, which was the firſt erected in Vermont. The court-houſe ſtands on an eminence, and commands a pleaſing proſpect of what is called the Great Oxbow of Connecticut river, where are the rich intervale lands called the Little Coos. Here a remarkable ſpring was diſcovered, about 20 years ſince, which dries up once in two or three years. It has a ſtrong ſmell of ſulphur, and throws up continually a peculiar kind of white ſand; and a thick yellow ſcum riſes upon the water when ſettled. This is the more noticeable as the water of the ponds and rivers in Vermont are remarkably clear and tranſparent. It is 130 miles north-eaſt of Bennington, and 417 N. E. by N. of Philadelphia. N. lat. 44 5. Number of inhabitants 873.—*ib.*

NEWBURY, a townſhip in Eſſex county, Maſſachuſetts, incorporated in 1635; ſituated on the ſouthern bank of Merrimack river, and contains 3,972 inhabitants. It formerly included Newbury-Port, and with Merrimack river encircles it. It is divided into five pariſhes, beſides a ſociety of Friends, or Quakers. Dummer academy, in this townſhip, is in a flouriſhing ſtate; it was founded by Lieut. Gov. Dummer in 1756, opened in 1763, and incorporated in 1782. The inhabitants are principally employed in huſbandry. The land, particularly in that part of the town which lies on Merrimack river, and is here called *Newbury-Newtown,* is of a ſuperior quality, under the beſt cultivation, and is ſaid by travellers to be little inferior to the moſt improved parts of Great-Britain. Some of the high lands afford a very extenſive and variegated view of the ſurrounding country, the rivers, the bay, and the ſea-coaſt from Cape Ann to York, in the Diſtrict of Maine. Some few veſſels are here owned and employed in the fiſhery, part of which are fitted out from Parker river. It riſes in Rowley, and after a courſe of a few miles, paſſes into the ſound which ſeparates Plumb-Iſland from the main land. It is navigable about two miles from its mouth. A woollen manufactory has been eſtabliſhed on an extenſive ſcale in Byefield pariſh, and promiſes to ſucceed. This townſhip is connected with Saliſbury by Eſſex Merrimack bridge, about 2 miles above Newbury-Port, built in 1792. At the place where the bridge is erected, an iſland divides the river into two branches: an arch of 160 feet diameter, 40 feet above the level of high water, connects this iſland with the main on the oppoſite ſide. The whole length of the bridge is 1030 feet; its breadth 34; its contents upwards of 6000 tons of timber. The two large arches were executed from a model invented by Mr Timothy Palmer, an ingenious houſewright in Newbury-Port. The whole is executed in a ſtyle far exceeding any thing of the kind hitherto eſſayed in this country, and appears to unite elegance, ſtrength and firmneſs. The day before the bridge was opened for the inſpection of the public, a ſhip of 350 tons paſſed under the great arch. There is a commodious houſe of entertainment at the bridge, which is the reſort of parties of pleaſure, both in ſummer and winter.—*ib.*

NEWBURY-PORT, a port of entry, and poſt-town in Eſſex county, Maſſachuſetts; pleaſantly ſituated on the S. ſide of Merrimack river, about 3 miles from the ſea. In a commercial view it is next in rank to Salem. It contains 4837 inhabitants, although it is, perhaps, the ſmalleſt townſhip in the State, its contents not exceeding 640 acres. It was taken from Newbury, and incorporated in 1764. The churches, 6 in number, are ornamented with ſteeples; the other public buildings are the court-houſe, gaol, a bank, and 4 public ſchool-houſes. To the honour of this town, there are in it 10 public ſchools, and 3 printing-offices. Many of the dwelling-houſes are elegant. Before the war there were many ſhips built here; but ſome years after the revolution, the buſineſs was on the decline: it now begins to revive. The Boſton and Hancock continental frigates, were built here, and many privateers, during the war. The harbour is ſafe and capacious, but difficult to enter. The Marine Society of this town, and other gentlemen in it, have humanely erected ſeveral ſmall houſes, on the ſhore of Plumb-Iſland, furniſhed with fuel and other conveniences, for the relief of ſhipwrecked mariners. Large quantities of rum are diſtilled in Newbury-Port, there is alſo a brewery; and a conſiderable trade is carried on with the Weſt-Indies and the ſouthern States. Some veſſels are employed in the freighting buſineſs, and a few in the fiſhery. In Nov. 1790, there were owned in this port, 6 ſhips, 45 brigantines, 39 ſchooners, and 28 ſloops; making in all, 11,870 tons. The exports for a year, ending Sept. 30, 1794, amounted to 363.380 dollars. A machine for cutting nails, has been lately invented by Mr Jacob Perkins of this town, a gentleman of great mechanical genius, which will turn out, if neceſſary, 200,000 nails in a day. Newbury-Port is 40 miles north-north-eaſt of Boſton, 22 ſouth-by-weſt of Portſmouth, 12 N. of Ipſwich, and 389 north-eaſt of Philadelphia. The harbour has 10 fathoms water: high water at full and change 15 minutes after 11 o'clock. The light-houſe on Plumb-Iſland lies in 42 47 north latitude, and in 70 47 weſt longitude.—*ib.*

NEW-CALEDONIA, the name given by the Scotch to the ill-fated ſettlement which that nation formed on the Iſthmus of Darien, and on the ſouth-weſt ſide of the gulf of that name. It is ſituated eaſtward of the narroweſt part of the iſthmus, which is between Panama and Porto Bello, and lies ſouth eaſt of the latter city. The ſettlement was formed in 1698. —*ib.*

NEW-CANTON, a ſmall town lately eſtabliſhed in Buckingham county, Virginia, on the ſouth ſide of James's river, 70 miles above Richmond. It contains a few houſes, and a ware-houſe for inſpecting tobacco. —*ib.*

NEW-CASTLE, the moſt northern county of Delaware State. It is about 40 miles in length and 20 in breath, and contains 19,686 inhabitants, including 2,562 ſlaves. Here are two ſnuff-mills, a ſlitting-mill, 4 paper-mills, 60 for grinding different kinds of grain, and ſeveral fulling-mills. The chief towns of this county are Wilmington and New-Caſtle. The land in it is more broken than any other part of the State. The heights of Chriſtiana are lofty and commanding. —*ib.*

New-Castle, a poſt-town, and the ſeat of juſtice of the above county. It is ſituated on the weſt ſide of Delaware river, 5 miles ſouth of Wilmington and 33 S. W. of Philadelphia. It contains about 70 houſes, a court-houſe and gaol; a church for Epiſcopalians and another for Preſbyterians. This is the oldeſt town on Delaware river, having been ſettled by the Swedes, about the year 1627, who called it *Stockholm*, after the metropolis of Sweden. When it fell into the hands of the Dutch, it received the name of *New-Amſterdam;* and the Engliſh, when they took poſſeſſion of the country, gave it the name of *New-Caſtle*. It was lately on the decline; but now begins to flouriſh. Piers are to be built, which will afford a ſafe retreat to veſſels, during the winter ſeaſon. Theſe, when completed, will add conſiderably to its advantages. It was incorporated in 1672, by the governor of New-York, and was for many years under the management of a bailiff and ſix aſſiſtants. N. lat. 39 38.—*ib,*

New-Castle, a townſhip in Weſt-Cheſter county, New-York, taken from North-Caſtle in 1791, and incorporated. In 1796, there were 151 of the inhabitants qualified electors.—*ib.*

New-Castle, a ſmall town in the county of Rockingham, New-Hampſhire, was incorporated in 1693, and contains 534 inhabitants.—*ib.*

New-Castle, a ſmall poſt-town in Lincoln county, Diſtrict of Maine, ſituated between Damaſcotte and Skungut rivers. It is 10 miles E. by N. of Wiſcaſſet, 66 N. E. of Portland, and 192 N. by E. of Boſton. The townſhip contains 896 inhabitants.—*ib.*

New-Castle, a poſt-town of Hanover county, Virginia, ſituated at the mouth of Aſſequin creek, on the S. W. ſide of Pamunky river, and contains about 36 houſes. It is 54 miles N. W. of Williamſburgh, 24 N. E. of Richmond, and 297 from Philadelphia.—*ib.*

NEW-CHESTER, a townſhip in Grafton county, New-Hampſhire, ſituated on the W. ſide of Pemigewaſſet river. It was incorporated in 1778, and contains 312 inhabitants. It is about 13 miles below the town of Plymouth.—*ib.*

NEW-CONCORD, formerly called *Gunthwaite,* a townſhip in Grafton county, New-Hampſhire, on Amonooſuck river, and was incorporated in 1768, and contains 147 inhabitants.—*ib.*

NEW-CORNWALL, a townſhip in Orange county, New-York; bounded northerly by Ulſter county, and eaſterly by Hudſon's river and Haverſtraw. It contains 4,225 inhabitants, incluſive of 167 ſlaves.—*ib.*

NEW-DUBLIN, a townſhip in Lunenburg county, Nova-Scotia; ſituated on Mahone Bay; firſt ſettled by Iriſh, and afterwards by Germans.—*ib.*

NEW-DURHAM, in Strafford county, New-Hampſhire, lies on the eaſt coaſt of Winnepiſſeoga Lake, weſt of Merry Meeting Bay, nearly 40 miles north-weſt of Portſmouth. Incorporated in 1762, having 554 inhabitants.—*ib.*

Situation and Extent.

NEW ENGLAND, the north-eaſtern grand diviſion of the United States of America, lies in the form of a quarter of a circle around the great bay, or part of the Atlantic Ocean, which ſets up to the north-weſt between Cape Cod and Cape Sable. It contains the ſtates of Vermont, New-Hampſhire, Maine, (belonging to Maſſachuſetts) Maſſachuſetts Proper, Rhode-Iſland and Providence Plantations, and Connecticut; and is ſituated between 41° and 48° north latitude and 1° 30′ and 10° 15′ eaſt longitude from Philadelphia. Its extreme length from the north-eaſt corner of Maine, to the ſouth-weſt corner of Connecticut, is about 626 miles: its breadth is very unequal, from fifty to two hundred miles. It contains about 72,000 ſquare miles.

Boundaries.

New England is bounded north, by Lower Canada; eaſt, by the Britiſh province of New Brunſwick and the Atlantic Ocean; ſouth, by the ſame Ocean and Long-Iſland ſound; and weſt, by the ſtate of New-York. Its weſt line begins at the mouth of Byram river, which empties into Long-Iſland ſound, at the ſouth-weſt corner of Connecticut, N. lat. 41°, runs a little to the eaſt of north till it ſtrikes the 45th degree of latitude, and then curves to the north-eaſt along the highlands, till it reaches about the 48th degree of north latitude.

Diſcovery.

In April 1614, Capt. John Smith with two ſhips, commenced a voyage of diſcovery to the northern coaſts of America: he firſt made the Iſland of Monahigan, then computed to be in latitude 43° 30′, where he built ſeven boats, in one of which, with 8 men, he ranged the coaſt from Penobſcot to Cape Cod, entered and ſurveyed what is now called Maſſachuſetts Bay, and made his obſervations on other parts of the coaſt. After his return to England, he wrought theſe ſurveys and obſervations into a map, which he preſented to Charles Prince of Wales, (afterwards King Charles I.) with a requeſt that he would give a name to this newly explored country. Accordingly he gave his own name to the river which divides Boſton from Charleſtown, and to the whole country that of New England.

At this period New England was thickly inhabited by

New-England.

Depopulation of New-England by a mortal peſtilence.

Belknap's Biog. vii. p. 210.

by various tribes of Indians. Two years after (1616) a moſt diſtreſſing mortal ſickneſs, by ſome ſuppoſed to have been the ſmall pox; by others the yellow fever; ſpread through the country, and ſwept off a large portion of its inhabitants. From an account given to the firſt ſettlers at Plymouth, on their arrival, by an intelligent Indian, it appears, that "by this peſtilence and a ferocious war, the number of Indians had been ſo diminiſhed, that not more than *one in twenty* remained; and that on the ſpot firſt occupied by the fathers of New England, now the town of Plymouth, though before very populous, every human being died of the peſtilence." This account was eaſily credited from the extent of the uncultivated fields, and the number of graves and human bones which appeared.

Curious account of this peſtilence.

An extraordinary occurrence relative to this peſtilence has been mentioned by the hiſtorian above named as follows.—"A French ſhip had been wrecked on Cape Cod; the men were ſaved with their proviſions and goods. The natives kept their eyes on them till they found an opportunity to kill all but 3 or 4, and divide their goods. The captives were ſent from one tribe to another as ſlaves. One of them learned ſo much of their language as to tell them that "God was angry with them for their cruelty, and would deſtroy them and give their country to another people." They anſwered that "they were too many for God to kill." He replied that "if they were ever ſo numerous, God had many ways to kill them of which they were then ignorant." Afterwards when this new and extraordinary peſtilence came among them, they remembered the man's words, and when the Plymouth ſettlers arrived at Cape Cod, the few ſurvivors imagined that the other part of his prediction would ſoon be accompliſhed."

Ibid. p. 208, 209.

From the year 1614 till 1620, an advantageous trade was carried on with the natives along the coaſt, but no ſettlements were made in any part of New England.

Firſt ſettlement of New England.

The firſt ſettlement of New England by a civilized and chriſtian people was the effect of religious perſecution. Soon after the commencement of the reformation in England, in the year 1534, the Proteſtants were divided into two parties; one the followers of LUTHER, and the other of CALVIN. The former had choſen gradually, and almoſt imperceptibly, to recede from the church of Rome; while the latter, more zealous, and convinced of the importance of a thorough reformation, and at the ſame time poſſeſſing much firmneſs, and high notions of religious liberty, were for effecting a thorough change at once. Their conſequent endeavours to expunge from the church all the inventions which had been brought into it ſince the days of the Apoſtles, and to introduce the "Scripture purity" acquired for them the name of PURITANS. From theſe the inhabitants of New England deſcended. The reaſons aſſigned for leaving their own country, and ſettling a wilderneſs were "that the ancient faith, and true worſhip, might be found inſeparable companions in their practice; and that their poſterity might be undefiled in religion." Letter of the miniſters of N. E. to Mr J. Duey, in Mather's Apology, App.

The firſt company that came to New England planted themſelves at Plymouth. They were a part of the Rev. Mr Robinſon's congregation, which, for 12 years before, had lived in Holland for the ſake of enjoying liberty of conſcience. They came over to America in the year 1620.

New-England.

Diſingenuous conduct of the Dutch.

Form of civil contract.

It was their intention to have ſettled at the mouth of Hudſon's river; but the Dutch, intending to plant a colony there of their own, privately hired the maſter of the ſhip to contrive delays in England, and then to conduct them to theſe northern coaſts, and there, under the pretence of ſhoals and winter, to diſcourage them from venturing to the place of deſtination. This is confidently aſſerted by the hiſtorians of that time. Although Cape Cod harbour, in which they firſt anchored, was good, the country around was ſandy and barren. Theſe were diſcouraging circumſtances; but the ſeaſon being far advanced, they prudently determined to make the beſt of their preſent ſituation. As they were not within the limits of the patent and conſequently not under the juriſdiction of the Virginia company, and having ſome factious perſons among them in the capacity of ſervants, who poſſeſſed a portion of the modern ſpirit of *liberty and equality*, and who had intimated that when on ſhore they ſhould be under no government, and that one man would then be as good as another, the more judicious thought it neceſſary to eſtabliſh a ſeparate government for themſelves. Accordingly, before they landed, having on their knees devoutly given thanks to God for their ſafe arrival, they formed themſelves into a body-politic, under the following *covenant* or *contract*, which they all ſubſcribed, and made the baſis of their government. "In the name of God, amen. We whoſe names are underwritten, the loyal ſubjects of our Dread Sovereign Lord, King James, by the grace of God, of Great Britain, France and Ireland, king, defender of the faith, &c.—Having undertaken for the glory of God and the advancement of the chriſtian faith, and honour of our king and country, a voyage, to plant the firſt colony in the northern parts of Virginia; Do by theſe preſents ſolemnly, and mutually, in the preſence of God, and of one another, covenant and combine ourſelves together into a civil body-politic, for our better ordering and preſervation and furtherance of the ends aforeſaid; and by virtue hereof to enact, conſtitute, and frame ſuch juſt and equal laws, ordinances, acts, conſtitutions, and offices, from time to time, as ſhall be thought moſt meet and convenient for the general good of the colony; unto which we promiſe all due ſubmiſſion and obedience: In witneſs whereof, we have hereunder ſubſcribed our names at Cape Cod, the 11th of November; in the year of the reign of our Sovereign Lord King James, of England, France and Ireland, the eighteenth, and of Scotland the fifty-fourth: Anno Domini, 1620."

This inſtrument was ſigned by 24 heads of families, with the number in their reſpective families annexed, and 17 ſingle men, making in the whole 101 ſouls.

John Carver firſt Governor.

Afterwards by an unanimous vote, they choſe JOHN CARVER their governor for one year.

Difficulties encountered by the coloniſts.

Having thus eſtabliſhed and organized their government, in its form truly republican, their next object was to fix on a convenient place for ſettlement. In doing this, they were obliged to encounter numerous difficulties, and to ſ[illegible]er incredible hardſhips. Many of them were ſick i[illegible]ence of the fatigue of a long voyage. Their proviſions were bad; the ſeaſon

Settled at Plymouth.

uncommonly cold, the Indians, though afterwards friendly, were now hoſtile; and they were unacquainted with the coaſt. Theſe difficulties they ſurmounted, and on the 22d of December, (Gregorian ſtyle) they were all ſafely landed at a place which, in grateful commemoration of Plymouth in England, the town which they laſt left in their native land, they called PLYMOUTH. The *rock* on which they firſt ſtepped aſhore is called the *foreſather's rock*. A part of it has been drawn up to be preſerved in the centre of the town; the remainder is buried in a wharf.

The day of their landing is now annually kept as a feſtival in Plymouth and Boſton.

Plymouth is the oldeſt Engliſh town in New England.

Fortunate diſcovery of ſeed corn.

In ſome of the excurſions of the immigrants in ſearch of a ſuitable place to ſettle, they found buried ſeveral baſkets of Indian corn, to the amount of 10 buſhels, which fortunately ſerved them for planting the next ſpring. They made diligent enquiry for the owners, whom they found, and afterwards paid them the full value of the corn. The acquiſition of this corn was always regarded as a particular favour of divine Providence, without which, the colony could not have ſubſiſted.

Firſt child born.

Before the end of November, Suſanna, the wife of William White, was delivered of a ſon, whom they called *Peregrine*. He is ſuppoſed to have been the firſt child, of European extract, born in New England. He died at Marſhfield July 1704, in the 84th year of his age.

Situation and proſpects of the coloniſts.

The whole company that landed conſiſted of but 101 ſouls; their ſituation was diſtreſſing, and their proſpects truly diſmal and diſcouraging. Their neareſt neighbours, except the natives, were the Dutch ſettlers at Albany and Bergen, a French ſettlement at Port Royal, and one of the Engliſh at Virginia: the neareſt of theſe was 200 miles from them, and utterly incapable of affording them any relief in a time of famine or danger. Wherever they turned their eyes diſtreſs was before them. Perſecuted for their religion in their native land; grieved for the profanation of the holy ſabbath, and other licentiouſneſs in Holland; fatigued by their long and boiſterous voyage; diſappointed, through the treachery of their commander, of their expected country; forced on a dangerous and inhoſpitable ſhore in the advance of a cold winter; ſurrounded with hoſtile barbarians, without any hope of human ſuccour in caſe of an attack; denied the aid or favour of the court of England; without a patent; without a public promiſe of a peaceable enjoyment of their religious liberties—worn out with toil and ſufferings, without convenient ſhelter from the rigour of the weather:—Such was the ſituation and ſuch the proſpects of theſe pious, ſolitary, chriſtians. And to add to their diſtreſſes, a general and very mortal ſickneſs prevailed among them which ſwept off forty-ſix of their number, before the opening of the next ſpring. To ſupport them under theſe trials, they had need of all the aids and comforts which chriſtianity affords, and theſe were ſufficient. The free and unmoleſted enjoyment of their religion reconciled them to their humble and lonely ſituation. They bore their hardſhips with unexampled patience, and perſevered in their pilgrimage of almoſt unparalleled trials, with ſuch reſignation and calmneſs, as gave proof of great piety, and unconquerable virtue. Immediately after landing, they began to lay out the town into ſtreets, and lots, and to erect buildings, for their accommodation. They firſt erected a ſtore houſe with a thatched roof, in which they depoſited, under a guard, their whole ſtock of ammunition and proviſions. On the 14th of Jan. the thatched roof of the ſtore houſe accidentally caught fire and was conſumed; but by the timely exertions of the people, the lower part of the building with its contents, which were indiſpenſible to the ſupport of the infant colony, was preſerved.

The council of Plymouth eſtabliſhed and New-England granted them.

On the 3d of November 1620, King James, being informed that an extenſive country in America had lately been depopulated by a mortal ſickneſs, and that no part of it was then inhabited by the ſubjects of any chriſtian prince, and being deſirous to advance the chriſtian religion, and extend the boundaries of his own dominions, ſigned a patent, incorporating the duke of Lenox, the marqueſſes of Buckingham and Hamilton, the earls of Arundel and Warwick, Sir Francis Gorges, with thirty-four others and their ſucceſſors, ſtiling them, "The council eſtabliſhed at Plymouth, in the county of Devon, for the planting, ruling, ordering, and governing, of New England in America."

To this council he granted all that part of America which lies between the 40th and 48th degrees of north latitude. They were inveſted with powers of juriſdiction over the country, and authorized to exclude all others from trading within their boundaries, and from fiſhing in the neighbouring ſeas. This charter was the great *civil baſis* of all the ſubſequent grants and patents, to the ſettlers of New England.

"This charter, (ſays the correct hiſtorian of Maſſachuſetts) from the omiſſions of ſeveral powers neceſſary to the future ſituation of the colony, ſhows how inadequate the ideas of the parties were to the important conſequences which were about to follow from ſuch an act. The governor, with the aſſiſtants and freemen of the company, it is true, were empowered to make all laws not repugnant to thoſe of England; but the power of impoſing fines, impriſonment or other lawful correction, is expreſsly given in the manner of other corporations of the realm; and the general circumſtances of the ſettlement, and the practice of the times, can leave us no doubt that this body-politic was viewed rather as a trading company, reſiding within the kingdom, than what it very ſoon became, a foreign government exerciſing all the eſſentials of ſovereignty over its ſubjects."

Minot's Hiſt. Maſſ.

Treaty with Maſaſſoit.

As early as March 1621, Maſaſſoit, one of the moſt powerful ſagamores of the neighbouring Indians, with ſixty attendants, made a viſit to the Plymouth ſettlers; and entered into a formal and very friendly treaty with them, wherein they agreed to avoid injuries on both ſides, to puniſh offenders—to reſtore ſtolen goods—to aſſiſt each other in all juſtifiable wars—to promote peace among their neighbours, &c. Maſaſſoit and his ſucceſſors for fifty years inviolably obſerved this treaty. The Engliſh are much indebted to this chief for his friendſhip, and his memory will ever be reſpected in New England.

War with the Narraganſet Indians.

The Narraganſets, diſliking the conduct of Maſaſſoit, declared war againſt him, which occaſioned much confuſion and fighting among the Indians. The Plymouth colony interpoſed in favour of Maſaſſoit, their good ally, and terminated the diſpute to the terror of their enemies. Even Canonicus himſelf, the terrific ſachem of the Narraganſets, ſued for peace.

Death of Gov. Carver.

In April of this year George Carver, while engaged in labour, with the reſt of the ſettlers, was ſeized with a pain in his head, which ſhortly after deprived him of his ſenſes, and, in a few days, of his life, to the great grief of theſe afflicted people. He was buried with all the honours in their power to beſtow.

Character.

Of this gentleman the following character is given by his biographer. "He was a man of great prudence, integrity, and firmneſs of mind. He had a good eſtate in England which he left in the emigration to Holland and America. He was one of the foremoſt in action, and bore a large ſhare of ſufferings in the ſervice of the colony, who confided in him as their friend and father. Piety, humility, and benevolence, were eminent traits in his character; and it is particularly remarked that in the time of general ſickneſs, which befel the colony, and with which he was affected, after he had himſelf recovered, he was aſſiduous in attending the ſick, and performing the moſt humiliating ſervices for them, without any diſtinction of perſons or characters." Belknap.

William Bradford choſen Governor.

He was ſucceeded by William Bradford, then in the thirty-third year of his age, a man of "wiſdom, piety, fortitude, and goodneſs of heart," and on theſe accounts much reſpected and beloved by the people. Iſaac Allerton was choſen his aſſiſtant in the adminiſtration of government. One of the firſt official acts of Gov. Bradford was to ſend an embaſſy to Maſaſſoit. His objects were to explore the country, to carry preſents, and confirm the league with that chief; to ſurvey his ſituation and ſtrength, to eſtabliſh a friendly intercourſe, and to procure ſeed corn for the next ſeaſon.

Embaſſy to Maſaſſoit.

Edward Winſlow and Stephen Hopkins, with Squanto for their guide, compoſed this embaſſy. This ſachem lived about 40 miles ſouthward of Plymouth. As they paſſed through the country, they obſerved the marks of the ravages which the peſtilence had made a few years before. They were received with friendſhip, and accompliſhed the buſineſs of their miſſion to the ſatisfaction of the governor.

Friendly diſpoſition of the Indians.

The prudent and upright conduct of the Plymouth colony towards the Indians, ſecured their friendſhip and alliance. Through the influence of Maſaſſoit, nine of the petty ſachems in his neighbourhood, who were jealous of the new coloniſts, and diſpoſed to give them trouble, came to Plymouth, and voluntarily ſubſcribed the following inſtrument of ſubmiſſion to the king of England, viz. "Sept. 13th A. D. 1621. Know all men by theſe preſents, that we whoſe names are underwritten, do acknowledge ourſelves to be the loyal ſubjects of King James, king of Great Britain, France and Ireland, defender of the faith, &c. In witneſs whereof, and as a teſtimonial of the ſame, we have ſubſcribed our names or marks as followeth:

Inſtrument of their ſubmiſſion.

Ohquamehud, Nattawahunt, Quadequina,
Cawnacome, Caunbatant, Huttamoiden,
Obbatinua, Chickatabak, Apannow."

Hobbamack, another of theſe ſubordinate chiefs, came and took up his reſidence at Plymouth, where he continued as a faithful guide and interpreter as long as he lived. The Indians of the iſland of Capawock, which had now obtained the name of Martha's or Martin's Vineyard, alſo ſent meſſengers of peace." Theſe tranſactions are ſo many proofs of the peaceful and benevolent diſpoſition of the Plymouth ſettlers. Belknap.

Maſſachuſetts Bay explored.

In September (1621) governor Bradford ſent ten men, with Squanto, in a ſhallop to explore the bay, now called Maſſachuſetts; they found that the iſlands in this bay had been cleared of wood, that they had been planted, but were now almoſt without inhabitants.

An acceſſion to the colony.

In November, a ſhip with thirty-five paſſengers arrived from England. Unfortunately for the little colony, the ſhip was ſhort of proviſions, and the coloniſts, out of their ſcanty pittance, were obliged to victual her home. In conſequence, before the next ſpring, they were reduced to great ſtraits, and obliged for ſome time to ſubſiſt on fiſh and ſpring water. To heighten their diſtreſſes the Narraganſet chief, Canonicus, threatened the peace of the colony by a meſſage ſent in "the emblematical ſtyle of the ancient Scythians, viz. a bundle of arrows bound with the ſkin of a ſerpent."—The governor returned the ſkin filled with powder, and ball, which had the deſired effect. Afraid of its contents, the chief returned it unopened and remained quiet. Belknap.

About this time a part of the colony of Virginia was ſurpriſed, and maſſacred by the Indians. From this circumſtance, and the hoſtile diſpoſition of the Narraganſets, the coloniſts, feeble as they were from famine, found it expedient to fortify their town; accordingly they ſurrounded it with a ſtockade and four flankarts, divided their company into four ſquadrons and alternately kept guard day and night. Their guns were mounted on a kind of citadel erected on the top of the town hill, with a flat roof; the lower ſtory of which ſerved them for a place of worſhip.

Firſt duel in New-England.

The practice of *duelling*, which has never prevailed in New England, was introduced by two ſervants, who quarrelled, and fought with *ſword* and *dagger*. Both were wounded, neither of them mortally. For this diſgraceful conduct, they were formally tried before the whole company, and ſentenced to have "their heads and feet tied together, and ſo to remain twenty-four hours, without meat or drink." In conſequence of their penitence, a part of their puniſhment was remitted.

Death of Squanto.

The ſummer of 1622 being dry, and the harveſt ſcanty, the coloniſts were obliged to ſeek a ſupply from the Indians. Governor Bradford, with the friendly and faithful Squanto for his guide and interpreter, made an excurſion for this purpoſe; during which, Squanto fell ſick and died. On his death bed he requeſted the governor to pray for him, that he might "go to the Engliſhman's God in heaven." This Indian deſerves to have his name recorded with honour, in the hiſtory of New England: he was one of the twenty Indians who were perfidiouſly taken by Capt. Thomas Hunt, in 1614, and carried to Malaga, and ſold as ſlaves for life. Thence he eſcaped to London, and afterwards returned to his native country, with the Plymouth colony. Forgetting the perfidy of thoſe, who, by artifice, made him a priſoner, and a ſlave, he became a hearty friend of the Engliſh, and ſo continued till his death, rendering them in various ways, moſt eſſential ſervices.

Governor Bradford was treated with great reſpect by the ſeveral tribes which he viſited, and the trade was conducted on both ſides, with confidence and juſtice. He purchaſed in the whole, 28 hhds. of corn, for which he paid in goods received from England.

Belknap.

The right to the lands, ſettled by the Engliſh coloniſts, was early purchaſed from or given by, the Indian proprietors. How great a part of New England was thus fairly obtained from the Indians, cannot be aſcertained. There is evidence to believe, however, that a large proportion of the ſoil was purchaſed, at what was then conſidered an equitable price.

Winſlow and Hamden viſit Maſaſſoit who is ſick.

In the ſpring of 1623, Maſaſſoit fell ſick, and ſent intelligence of it to the governor, who immediately ſent Mr Winſlow, and *Mr John Hamden*, (the ſame man who afterwards diſtinguiſhed himſelf, by his oppoſition to the arbitrary, and unjuſt demands of Charles I.) to pay him a viſit. They carried with them preſents, and ſome cordials for his relief. Their viſit and preſents were very conſolatory to the venerable chief, and were the means of his recovery.

He diſcovers a conſpiracy of the Indians.

Belknap.

In return for their kindneſs, he informed them of a dangerous conſpiracy among the neighbouring Indians, the object of which was, the total extirpation of the Engliſh. By means of this timely diſcovery, and the conſequent ſpirited exertions, of the governor, whoſe wiſe plans were executed by the brave Capt. Standiſh, the colony was once more ſaved from deſtruction.

John Peirce obtains a patent for the coloniſts from the Council of Plymouth.

His diſingenuous conduct, and ſubſequent misfortunes.

The “ contract,” entered into by the coloniſts at Cape Cod, on their arrival, was intended only as a temporary ſubſtitute for legal authority from their ſovereign. Accordingly as ſoon as they were informed of the eſtabliſhment of the “ council at Plymouth, for planting New England,” before mentioned, they applied for, and obtained a patent. It was taken out, in the name of John Pierce, in truſt for the colony. “ When he ſaw that they were well ſeated, and that there was a proſpect of ſucceſs to their undertaking, he went, without their knowledge, but in their name, and ſolicited the council for another patent of greater extent; intending to keep it to himſelf, and allow them no more than he pleaſed, holding them as his tenants, to ſue and be ſued at his courts. In purſuance of this deſign, having obtained a patent, he bought a ſhip, which he named the Paragon; loaded her with goods, took on board upwards of ſixty paſſengers, and ſailed from London, for the colony of New Plymouth. In the Downs he was overtaken by a tempeſt, which ſo damaged the ſhip that he was obliged to put her into dock; where ſhe lay ſeveral weeks, and her repairs coſt him one hundred pounds. In December 1622, he ſailed a ſecond time, having on board one hundred and nine perſons; but a ſeries of tempeſtuous weather, which continued fourteen days, diſabled his ſhip, and forced him back to Portſmouth. Theſe repeated diſappointments proved ſo diſcouraging to him, that he was eaſily prevailed upon by the company of adventurers to aſſign his patent to them, for five hundred pounds. The paſſengers came over in other ſhips.”

Belknap's Biog. vol. ii. p. 234.

Charter attacked.

In the year 1624, the charter of the Plymouth Council was attacked by the Britiſh Parliament, and ſome vigorous reſolutions were paſſed in the Houſe of Commons, which ſo far deprived the Council of their reſources, that, it ſeems, they no longer thought it practicable to ſettle a plantation, though it appointed a governor general for New England. In conſequence the patentees prudently concluded to divide the country among themſelves. Accordingly, in the preſence of King James, they drew lots for the ſhares that each one was to poſſeſs, as his excluſive property; the royal confirmation was to be obtained to each particular portion. This was not however immediately given, and they continued a few years longer to act as a body-politic, and to make grants of different portions of the country to various ſocieties.

Patentees divide the country among themſelves.

Neat cattle firſt imported into New England.

In March 1624, Mr Winſlow, who had been previouſly ſent to England for the purpoſe, arrived with a ſupply of clothing, and brought with him a *bull* and *three heifers*, which were the firſt neat cattle imported into New England. None of the domeſtic animals were found in America, by the firſt European ſettlers.

Situation of the colony.

At the cloſe of this year, the Plymouth colony conſiſted of 180 perſons only, who lived in 32 dwelling houſes. Their ſtock conſiſted of the cattle brought over by Mr Winſlow, a few goats and a plenty of ſwine and poultry. Their town half a mile in compaſs, was impaled. On a high mount in the town, they had erected a fort of wood, lime, and ſtone, and a handſome watch tower.

Death of Rev. Mr. Robinſon.

The year following, (March 1625) that truly venerable and good man, the Rev. Mr Robinſon, whoſe memory is precious in New England, died at Leyden, in the 50th year of his age, greatly lamented, both in Holland and by that part of his congregation who had ſettled at Plymouth. In a few years after, part of his people who had remained with him in Holland, removed, and joined their brethren at Plymouth.

In 1629, when the plantation conſiſted of about 300 ſouls, a patent of larger extent than the one which Pierce had obtained and relinquiſhed, was ſolicited by Iſaac Allerton, and taken out in the name of “ William Bradford, his heirs, aſſociates, and aſſigns.”* This patent confirmed their title, (as far as the crown of England could confirm it) to a tract of land, bounded on the eaſt and ſouth, by the Atlantic ocean, and by lines drawn weſt from the rivulet of Conohaſſet, and north from the river of Narraganſet, which lines meet in a point, comprehending all the country called Pokanokit. To this tract they ſuppoſed they had a prior title from the depopulation of a great part of it by a peſtilence, from the gift of Maſaſſoit, his voluntary ſubjection to the crown of England, and his having protection of them. In a declaration publiſhed by them in 1636, they aſſerted their “ lawful right in reſpect of vacancy, donation, and purchaſe of the natives,”† which, together with their patent from the crown through the council of New England, formed “ the warrantable ground, and foundation of their government, of making laws, and diſpoſing of lands.”(A)

* Hazard's Hiſt. Col. vol. 1. p. 298.

Mr Bradford ſurrendered this patent to the general court, at their requeſt, in 1640.

Extent of the patents.

Title.

† Hazard i. 401.

In

(A) In 1639, after the termination of the Piquod war, Maſaſſoit, who had then changed his name to Wooſamequen, brought his ſon Mooanam to Plymouth, and deſired that the league which he had formerly made, might be renewed, and made inviolable. The ſachem and his ſon voluntarily promiſed, “ for themſelves and their ſucceſſors, that they would not needleſsly, nor unjuſtly raiſe any quarrels, or do any wrong to other

Grant on Kennebeck River.

In the ſame patent was granted, a large tract bordering on the river Kennebeck, where they had carried on a traffic with the natives for furs, as they did alſo at Connecticut river, which was not equally beneficial becauſe they had the Dutch for rivals.* The fur trade was found to be much more advantageous than the fiſhery. Sometimes they exchanged corn of their own growth for furs; but European coarſe cloths, hard ware, and ornaments, were good articles of trade, when they could command them.

* Hutch. ii. 469. Prince 157.

Difference between the trading company in England and the planters.

The company in England, with which they were connected, did not ſupply them in plenty. Loſſes were ſuſtained by ſea; the returns were not adequate to their expectations; they became diſcouraged; threw many reflections on the planters, and finally refuſed them any farther ſupplies;† but ſtill demanded the debt due from them, and would not permit them to connect themſelves in trade with any other perſons. The planters complained to the council of New England, but obtained no redreſs. After the expiration of the ſeven years, (1628) for which the contract was made, eight of the principal perſons in the colony, with four of their friends in London, became bound for the balance; and from that time took the whole trade into their own hands. Theſe were obliged to take up money at an exorbitant intereſt, and to go deeply into trade at Kennebeck, Penobſcot, and Connecticut; by which means, and their own great induſtry and economy, they were enabled to diſcharge the debt, and pay for the tranſportation of thirty-five families of their friends from Leyden, who arrived in 1629.”

† Bradford's Letters Hiſt. Col. viii. p. 29, 56, 60.

Belknap's Biog. vol. ii. 235, &c.

Perſecution of the Puritans.

Syſtems of ſports eſtabliſhed.

The perſecution of the Puritans in England, under Archbiſhop Laud, now raged with unrelenting ſeverity, and while it cauſed the deſtruction of thouſands in England, proved to be a principle of life and vigour to the infant colonies in New England. Among other expedients for vexing the Puritans (who were now compoſed both of the diſſenters from the eſtabliſhed church, and the oppoſers of deſpotic monarchy;) “a ſyſtem of ſports and recreations on the Lord's day which had been originated in the laſt reign, was revived and eſtabliſhed by the king. This meaſure was directly calculated both to obviate the objections of the Roman Catholics to the ſuppreſſion of feaſts and revels, and to wound the feelings of the Puritans, and embarraſs their clergy; as they were remarkable for a ſtrict attention to the fourth commandment, ſtill ſo decently obſerved by their deſcendants. The magiſtrates had found theſe ſports which conſiſted of dancing, leaping, vaulting, and various other games, to be introductory of profanation, and attempted to ſuppreſs them; but ſo great was the zeal of the court to root out Puritaniſm, which, from the ſtrict obſervation it enjoined of the Lord's day, they conceived, tended to diminiſh the feaſt days of the church; that the repreſentations of the magiſtrates were overruled, and the order eſtabliſhing the book of ſports was directed to be read in every pariſh. This was a net to entangle the clergy, and many loſt their livings, for conſcientiouſly refuſing to read the order. In ſhort, it became evident, in the ſtar-chamber language of the Earl of Dorſet, that to be guilty of drunkenneſs, uncleanneſs, or any leſs fault, might be pardonable; but that the ſin of Puritaniſm and non-conformity was without forgiveneſs.”

Minot's continuation of Hiſt. of Maſſa. p. 13.

O. Cromwell and others contemplate a removal to New-England. Prevented by Apb. Laud.

Such being the ſituation of affairs in England, ſeveral men of eminence, who were the friends and protectors of the Puritans, entertained a deſign of ſettling in New England, if they ſhould fail in the meaſures they were purſuing for the eſtabliſhment of the liberty, and the reformation of the religion of their own country. They ſolicited and obtained grants in New England and were at great pains in ſettling them. Among theſe patentees, were the Lords Brook, Say, and Seal, the Pelham's, the Hampden's, and the Pym's; names which afterwards appeared with great eclat. Sir Mathew Boynton, Sir William Conſtable, Sir Arthur Haſlerig, and Oliver Cromwell, were actually on the point of embarking for New England; when Archbiſhop Laud unwilling that ſo many objects of his hatred ſhould be removed out of the reach of his power, applied for, and obtained, an order from the court to put a ſtop to theſe tranſportations. “Reſtrictions were laid upon their eſcape, and whilſt ſome had fled to foreign countries, others were not ſo fortunate as to obtain this dreadful privilege, but were detained as hoſtages for the good conduct of their brethren abroad.” However, he was not able to prevail ſo far as to hinder New England from receiving vaſt additions, as well of the clergy, who were ſilenced and deprived of their living for non-conformity, as of the laity, who adhered to their opinions. As in all countries where perſecution rages, ſo here, the wiſeſt, moſt wholeſome, and moſt uſeful members of the community, were compelled to leave their country. “Multitudes, (ſaid Dr Owen, ſpeaking of theſe times) of pious and peaceable Proteſtants, were driven by the ſeverities of their perſecutors to leave their native country, and ſeek a refuge for their lives and liberties, with freedom for the worſhip of God, in a wilderneſs, in the ends of the earth.”—By ſuch people New England was firſt ſettled. A body of men more remarkable for their piety, and morality, and more reſpectable for their wiſdom, never perhaps commenced the ſettlement of any other country.

Minot.

Character of the firſt ſettlers of New England.

Maſſachuſetts ſettled.

As early as 1626, a few people from Plymouth, conducted by Mr Roger Conant, commenced a ſettlement on Naumkeag river. Diſcouraged by the difficulties they had to encounter, they had determined to quit America and return to England; but, encouraged by the Rev. Mr White, of Dorcheſter in England, who, with other influential characters that were deſirous of providing an aſylum in America, for the perſecuted non-conformiſts, aſſured them, if they would remain, that they ſhould receive a patent, ſupplies, and friends,

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natives to provoke them to war againſt the colony, and that they would not give, ſell or convey any of their lands, territories, or poſſeſſions whatever, to any perſon or perſons whomſoever, without the privity or conſent of the government of Plymouth, other than to ſuch as the ſaid government ſhould ſend or appoint. The whole court did then ratify and confirm the aforeſaid league, and promiſe, to the ſaid Wooſamequen, his ſon and ſucceſſors, that they would defend them againſt all ſuch as ſhould unjuſtly riſe up againſt them, to wrong or oppreſs them.”—Morton's Memorial p. 150.

friends, relinquiſhed their deſign, and concluded to wait the event. Accordingly, on the 19th of March 1627, Sir Henry Roſwell, and ſeveral other gentlemen, in the vicinity of Dorcheſter, purchaſed of the council of Plymouth, all that part of New England, included within a line drawn from the Atlantic ocean, 3 miles ſouth of Charles river, and 3 miles north of the Merrimac to the South ſea. But as the council gave them no powers of government, they afterwards obtained a charter of incorporation, from Charles I. conſtituting them a body-politic, by the name of the "Governor and Company of Maſſachuſetts Bay in New England," with powers as extenſive as any other corporation in England. The charter recited the grant of American territory to the council of Plymouth in 1620. It regranted Maſſachuſetts Bay to Henry Roſwell and others. The whole executive power of the corporation was veſted in a governor, deputy governor, and eighteen aſſiſtants; and until the annual election of the company could commence, the governor, deputy governor, and eighteen aſſiſtants were ſpecified. The governor, and ſeven, or more aſſiſtants, were authoriſed to meet in monthly courts, for diſpatching ſuch buſineſs as concerned the company or ſettlement. But the legiſlative powers of the corporation, were veſted in a more popular aſſembly, compoſed of the governor, deputy governor, the aſſiſtants, and freemen of the company. This aſſembly to be convened on the laſt Wedneſday of each of the four annual terms, by the title of "the General Court," was empowered to enact laws and ordinances for the good of the body-politic, and the government of the plantation, and its inhabitants; provided they ſhould not be repugnant to the laws and ſtatutes of England. This aſſembly was empowered to elect their governor, deputy governor, and other neceſſary officers, and to confer the freedom of the company. The company was allowed to tranſport perſons, merchandize, weapons, &c. to New England, exempt from duty for the term of ſeven years; and emigrants were entitled to all the privileges of Engliſhmen. Such are the general outlines of the charter. Under this charter Mathew Cradock was elected the firſt governor, and Thomas Goff, deputy governor; Capt. John Endicott, who, the year before (1627) had gone over with one hundred perſons to Salem to prepare the way for the ſettlement of a permanent colony, was appointed, by the Plymouth company, governor for the plantation.

Purchaſed of the Plymouth council.

March 4, 1628.] Charter obtained.

Its contents.

H. Adams's Hiſt. N. Eng. p. 27. Cradock appointed Governor.

Hutchinſon.

In May 1628, about two hundred perſons, with the Rev. Meſſrs Skelton, Higginſon, and Bright, embarked for New England, and arrived at Naumkeag, now Salem, on the 29th of June. The whole colony under governor Endicott, now conſiſted of about 300 ſouls; 100 of whom, the ſame year removed to Charleſtown. Meſſrs Skelton and Higginſon remained at Salem, where they formed, and were ordained over, the firſt church in that town; Mr Bright removed with the migrants to Charleſtown.

Firſt church formed in Salem.

The ſituation of the perſecuted puritans in England became more and more intolerable, and intereſted numbers of reſpectable, and wealthy people, in their behalf, and converted them to their principles. Several more of conſequence in the nation, had formed a reſolution to emigrate to Maſſachuſetts, provided they ſhould be permitted to carry the charter with them. They were aware of the inconvenience of being governed, in a new and diſtant country, different in moſt reſpects from England, by men, over whom they had no controul. They inſiſted therefore that the charter ſhould be tranſmitted with them, and that the corporate powers which it conferred ſhould in future be executed in New England. Though the legality of the propoſed meaſure was queſtioned, yet the importance of engaging men of wealth and influence in the enterprize, induced Gov. Cradock, who entered fully into their views, to call a general court Aug. 29th 1629, to whom he ſubmitted the queſtion; whereupon it was unanimouſly reſolved "that the patent ſhall be transferred, and the government of the corporation removed from London to Maſſachuſetts Bay." The members of the corporation who remained in England, were, by agreement, to retain a ſhare in the trading ſtock, and the profits of it, for ſeven years; but it does not appear that any dividend was ever made, or that any trade was carried on for the company.

Charter to be transferred to Maſſachuſetts.

Chalmers, p. 151.

On the 20th of October 1629, the company proceeded to a new choice, of officers to conſiſt of ſuch perſons as had determined to go over with the charter. John Winthrop was elected governor, John Humphry deputy governor, Sir Richard Saltonſtall and ſeventeen other aſſiſtants. The deputy governor and ſeveral of the aſſiſtants, never came to America. Their places were ſupported by a new choice. Thomas Dudley was choſen deputy governor in place of Mr Humphreys.

John Winthrop governor.

In the ſpring of 1630, theſe officers, with about 1500 emigrants, embarked at various ports in England, in eleven veſſels fitted at the expence of more than £21,000 ſterling, having their charter on board, and after a tedious voyage, they arrived at Salem in June, and at Charleſtown the beginning of July. In conſequence, the 8th day of this month, was celebrated in all the plantations in New England as a day of public thankſgiving to God, "for all his goodneſs, and wonderful works to them."

Fifteen hundred coloniſts embark for New England.

Prince's Chronology, p. 211.

But there were ſeveral circumſtances which operated as drawbacks, upon the joys of this occaſion. An extenſive and formidable conſpiracy of the Indians, as far as Narraganſet, for the purpoſe of extirpating the Engliſh coloniſts, had been, but a few months before, diſcovered to the inhabitants of Charleſtown, by John Sagamore, in ſeaſon, however, to prevent its horrid execution. The alarm and terror which this event had occaſioned, had hardly ſubſided.—Of three hundred perſons, who were previouſly at Salem and Charleſtown, eighty had died the preceding winter. There was not corn enough to ſupply their neceſſities for a fortnight; and their other proviſions, in conſequence of their long voyage, were reduced to ſcanty pittance. They were obliged to let their ſervants (who had coſt them from fifteen to twenty pounds each), go free, and provide for themſelves. Under all theſe diſadvantages they had a few months to prepare ſhelter and food for a long and cold winter. To increaſe their calamities, a mortal ſickneſs ſoon commenced its ravages among them, and before December, two hundred of their number had died. Among theſe was Lady Arabella, who "came from a paradiſe of plenty and pleaſure in the family of a noble Earl, into a wilderneſs of wants," Mr Johnſon, her huſband, highly eſteemed for his pi-

Indian conſpiracy.

Scarcity.

Mortality among the coloniſts.

ety and wiſdom," and one of the aſſiſtants, and Mr Roſſiter another of the aſſiſtants.—To conſole them under their ſevere diſtreſſes, Mr Wilſon preached to them on the ſubject of Jacob's behaviour, who was not diſheartened by the death of his neareſt friends on the way, when God called him to remove. This worthy miniſter was liberal, almoſt to an extreme, in adminiſtering to the relief of the neceſſitous, he was indeed at all times a father to the poor; and even the wretched Indians often taſted of his bounty.

Part of the colonists return.

Diſcouraged by ſuch calamities, and gloomy proſpects, about an hundred perſons who had lately arrived, of "weaker minds," and not of the beſt characters, returned to England in the veſſels which brought them over. The return of theſe was conſidered as no loſs to the plantation. This new acceſſion to the Maſſachuſetts colony collected, ſome from the weſt of England, but chiefly from the vicinity of London, were of all trades and occupations, neceſſary for planting a new country. As there were not buildings ſufficient to accommodate ſuch a number of people, the artificers among them erected tents, and temporary booths for their accommodation.

Firſt Chriſtians gathered in Charleſtown and Boſton.

As the great object of theſe chriſtian pilgrims, in leaving their native country, and ſettling this wilderneſs, was to "enjoy the ordinances of the goſpel and worſhip the Lord Jeſus Chriſt according to his own inſtitutions," Gov. Winthrop, Lieut. Gov. Dudley, Mr Johnſon, and the Rev. Mr Wilſon, on the 30th of July, 1630, entered into a formal and ſolemn covenant with each other, and thus laid the foundation of the church in Charleſtown and Boſton. On the 27th of Auguſt following, Mr Wilſon was ordained paſtor of the church at Charleſtown. This was the firſt ordination that took place in Maſſachuſetts.

Prince's Chron. p. 243.

ibid. p. 247.

Firſt court of aſſiſtants held at Charleſtown.

On the 23d of Auguſt 1630, the firſt court of aſſiſtants was held at Charleſtown on board the Arabella, conſiſting of Gov. Winthrop, deputy Gov. Dudley, and Sir Richard Saltonſtall, Meſſrs Ludlow, Roſſiter, Newell, T. Sharp, Pynchon, and Bradſtreet, aſſiſtants. This court was formed for the determination of great affairs, civil and criminal Juſtices of the Peace, inveſted with the ſame authority as like magiſtrates in England, and other officers, were appointed for the preſervation of tranquillity. The firſt queſtion that came before them was, "how the miniſters ſhould be maintained?" On the propoſal of Meſſrs Wilſon and Phillips, the court ordered that houſes ſhould be built for them at the public charge, and the governor, and Sir Richard Saltonſtall, were appointed to carry the order into effect. It was at the ſame time ordered that Mr Phillips's ſalary ſhould be £30, a year, and Mr Wilſon's £20, "till his wife ſhould come over." Thomas Morton, of Mount Wollaſton, who had ſtolen a boat from the Indians, was ordered to be brought before them for trial, without delay.—Carpenters, joiners, bricklayers, ſawyers, and thatchers, were ordered to take no more than two ſhillings a day, under penalty of ten ſhillings, to giver or taker," and Mr Bradſtreet was choſen Secretary.

ibid. 246, 247.

Second court.

Morton tried and ſentenced.

On the 7th of September, a ſecond court was held at Charleſtown, before which Morton was tried, condemned, and ſentenced to be ſet in the *bilbows*, and afterwards to be ſent priſoner to England by the ſhip called the *Gift*, now returning thither; that all his goods ſhall be ſeized to defray the charges of his tranſportation, payment of his debts, and to give ſatisfaction to the Indians for a canoe he had unjuſtly taken from them; and that his houſe be burnt down to the ground, in ſight of the Indians for their ſatisfaction, for the many wrongs he had done them." All perſons were forbidden to plant within the limits of their patent, without leave from the court; thoſe perſons who had ſet down at Agawara were ordered to remove; Trimountain they named *Boſton*, Mattapan *Dorcheſter*, and the town on Charles River *Watertown*.

Prince, p. 248.

Watertown, Boſton, and Roxbury ſettled.

Before the following winter, Sir Richard Saltonſtall, with Mr Phillips and others removed, and formed a plantation at *Watertown;* the greater part of the church in Charleſtown, with Mr Wilſon, removed and ſettled in Boſton. Another company, with Mr Pynchon at their head, ſettled at Roxbury.

Plan of a fortified town, formed but relinquiſhed.

On the 6th of December the governor and aſſiſtants met, and agreed to fortify the Boſton Neck; but the deſign was relinquiſhed ſhortly after, and inſtead of a fortification in this place, they concluded to build, the next ſpring, a fortified town, on the ſpot, near where Harvard Univerſity has ſince been eſtabliſhed, then called Newtown. In the ſpring following, the governor accordingly began to erect a houſe; and the deputy governor finiſhed his, and removed his family. But the neighbouring Indians manifeſting a friendly diſpoſition, the apprehenſions of danger leſſened, and the plan of a fortified town was relinquiſhed. The governor ſettled at Boſton, and the deputy governor removed to Roxbury.

Hutchinſon, vol. I. p. 28.

Alarming Scarcity.

As the winter approached, proviſions became extremely ſcarce; the people were compelled to ſubſiſt on clams, muſcles, groundnuts, and acorns, and even theſe were procured with great difficulty, while the ſnow covered the ground. Theſe trials diſcouraged many; and when it was announced that "the governor had the laſt batch of bread in the oven," they almoſt deſpaired of receiving ſeaſonable relief. They were moreover full of fears, leſt a ſhip which had been diſpatched to Ireland for proviſions, had either been caſt away, or taken by pirates. But God, in his good providence, ſent them timely relief. In their trouble, they had appointed a day to ſeek the Lord by faſting and prayer. Before the day came, the ſhip, with proviſions, competent to their neceſſities, arrived, and they changed the day of faſting into a day of thankſgiving.

Mr. Abbot's M. S. notes.

Third court holden.

After a winter of great ſufferings the court convened in the ſpring 1631, and ordained, "that the governor and aſſiſtants ſhall, in future, be choſen by the freemen alone; that none ſhould be admitted to the freedom of the company but ſuch as were choſen members, who had certificates from their miniſters that they were of orthodox principles; and that none but freemen ſhould vote at elections, or act as magiſtrates or jurymen." This extraordinary law continued in force, till the writ of *quo warranto*, in 1684, annihilated the government which enacted it.

Chalmers, p. 153.

Good effects of the ſcarcity.

The diſtreſſes endured the preceding ſeaſon induced the coloniſts to pay great attention to the raiſing of proviſions for their future ſupport. To encourage a ſpirit ſo laudable and neceſſary, the court enacted "That Indian corn ſhould be deemed a legal tender in diſcharge of debts." A great part of the cattle which had been imported from England had died; and a milch-cow was now valued at twenty-five to thirty pounds ſterling.

Union between the colonies of Maſſachuſetts and Plymouth.

Two colonies, one at Plymouth, the other at Maſſachuſetts, were now planted in New-England. Both were critically ſituated in reſpect to their neighbours. The Plymouth ſettlers had erected a trading houſe at Penobſcot about the year 1627; of this the French from Arcadia had taken poſſeſſion. This gave riſe to complaints on both ſides of incroachments on their reſpective rights, which led on finally to war between the parent countries.

The Maſſachuſetts colony was threatened by the ſurrounding Indians. In theſe circumſtances prudence dictated that union ſhould be eſtabliſhed between the two infant colonies. To bring about a meaſure ſo neceſſary to their ſafety, the Governor, with the Rev. Mr Wilſon and others proceeded to Plymouth, 40 miles through the wilderneſs on foot. They were kindly and reſpectfully received by governor Bradford, and the principal gentlemen at Plymouth; and the reſult of this embaſſy was a laſting friendſhip between the colonies.

Complaint againſt the coloniſts.

The coloniſts, in their zeal to preſerve the unity and purity of the faith, had expelled from among them ſome, whoſe principles and conduct they diſapproved. Theſe perſons complained to the king of the wrongs they had ſuffered. Their complaint was referred to the privy council for colonies, Jan. 1632; but moſt of the charges being denied, and "to avoid diſcouragement to the adventurers, and in hopes that the colony which then had a promiſing appearance would prove beneficial to the kingdom," the complaint was diſmiſſed.

Chalmers.

New embarkations for New-England, and the order of the king thereupon.

The ſpirit of perſecution ſtill raged in England. Many of the perſecuted, leſs enterpriſing than their brethren who had already migrated to America, had been waiting with ſolicitude to know their ſituation and proſpects. Satiſfied on theſe points from the accounts they had received, great numbers embarked this year (1633) for New England. So numerous, and of ſuch character were theſe emigrants, that the king in council thought fit to iſſue the following order, Feb. 21. 1633. "Whereas the board is given to underſtand of the frequent tranſportation of great numbers of his majeſty's ſubjects out of this kingdom to the plantation of New-England, among whom divers perſons known to be ill affected, diſcontented, not only with civil but eccleſiaſtical government here, are obſerved to reſort thither, whereby ſuch confuſion and diſtraction is already grown there, eſpecially in point of religion, as beſides the ruin of the ſaid plantation, cannot but highly tend both to the ſcandal of church and ſtate here: And whereas it was informed in particular, that there are at the preſent, divers ſhips in the river of Thames, ready to ſet ſail thither, freighted with paſſengers and proviſions: It is thought fit, and ordered that ſtay ſhould be forthwith made of the ſaid ſhips until further order from the board. And the ſeveral maſters and freighters of the ſame ſhould attend the board, on Wedneſday next in the afternoon, with a liſt of the paſſengers, and proviſions in each ſhip. And that Mr Cradock a chief adventurer in that plantation, now preſent before the board, ſhould be required to cauſe the letters patent for the ſaid plantation to be brought to this board."

Hutchinſon.

This order, however, in conſequence of an able vindication of the conduct of the governor, and coloniſts of New-England by ſuch of the company as were preſent, did not put a ſtop to emigrations. In ſome of the ſummer months of this year there arrived 12 or 14 ſhips filled with paſſengers. Among the diſtinguiſhed characters who came over about this time were Mr Haynes, Sir Henry Vane, and the Rev. Meſſrs Cotton, Hooker and Stone.—The firſt was afterwards many years governor of Connecticut. The ſecond was the next year elected governor of Maſſachuſetts. The three laſt named were among the moſt eminent divines of that day, and their migration to New-England, drew after them multitudes of the perſecuted puritans. Mr Cotton is ſaid to have been more uſeful and influential in ſettling the civil as well as eccleſiaſtical polity of New-England than any other perſon.

Repreſentative government eſtabliſhed, and the rights of the people aſſerted.

Until this period the legiſlative powers had been exerciſed by the governor, deputy governor, and aſſiſtants, and the whole body of freemen in perſon, though the latter had been permitted to have but little ſhare in the government; but the colony had now become ſo numerous that it was inconvenient and indeed impracticable to legiſlate in one aſſembly; nor was it ſafe, ſurrounded as they were with hoſtile Indians, for the freemen to leave their families for ſo long a time unprotected: Neceſſity therefore obliged them to eſtabliſh a *repreſentative form of government*, which they did by general conſent, though no expreſs proviſion was made for it in the charter. Accordingly the freemen elected twenty-four deputies, who appeared in general court, May, 1634, as their repreſentatives. Their firſt buſineſs was to aſſert the rights of the people by paſſing the following reſolutions; viz. "That none but the general court had power to make and eſtabliſh laws, or to elect and appoint officers as governor, deputy governor, aſſiſtants, treaſurer, ſecretary, captains, lieutenants, enſigns, or any of like moment, or to remove ſuch upon miſdemeanor, or to ſet out the duties or powers of theſe officers.—That none but the general court hath power to raiſe monies, and taxes, and to diſpoſe of lands, viz. to give and confirm proprieties." After theſe reſolutions, they proceeded to the election of magiſtrates. Then they further determined, "That there ſhall be four general courts held yearly, to be ſummoned by the governor for the time being, and not to be diſſolved, but by conſent of the major part of the court. That it ſhall be lawful for the freemen of each plantation to chooſe two or three, before every general court, to confer of, and prepare, ſuch buſineſs as by them ſhall be thought fit to conſider of at the next court; and that ſuch perſons as ſhall be hereafter ſo deputed by the freemen of the ſeveral plantations, to deal in their behalf in the affairs of the commonwealth, ſhall have the full power and voices of all the ſaid freemen, derived to them for the making and eſtabliſhing of laws, granting of lands, &c. and to deal in all other affairs of the commonwealth, wherein the freemen have to do, the matter of election of magiſtrates and other officers only excepted, wherein every freeman is to give his own voice."—And to ſhow their reſentment, they impoſed a fine upon the court of aſſiſtants for going contrary to an order of the general court. "The legiſlative body thus organized, continued without alteration, (except that the number of general courts annually was reduced, in 1644, from four to two,) till the loſs of the charter in 1684. This is ſuppoſed to have been the ſecond houſe

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houſe of repreſentatives that ever aſſembled in America. A houſe of burgeſſes met for the firſt time in Virginia, May 1620, fourteen years before.

Code of laws enacted.

Having thus eſtabliſhed their form of government, the enaction of a code of laws was the next buſineſs in courſe. The leading characters among the coloniſts, were of opinion that the ſubjects of any prince or ſtate had a natural right to emigrate to any other ſtate or country, when deprived of liberty of conſcience, and that upon ſuch a removal their allegiance ceaſed. They conſidered their ſubjection to the crown of England as voluntary, and founded on mutual compact, and this compact was their charter. They maintained their right to make their own laws, and to elect their own magiſtrates, but acknowledged that their laws muſt not be repugnant to thoſe of England; and that by their compact they had no right to be ſubject to, nor ſeek protection from, any foreign prince. With theſe ſentiments, and without any partiality for the laws of their mother country, under which they had ſuffered ſo many hardſhips, it is not ſurpriſing that they did not adopt the laws of England as the foundation of their code. The peculiarity of their ſituation, indeed, rendered neceſſary correſponding laws and regulations. And as their leading object in migrating to this country, was to enjoy liberty of conſcience, and to ſupport and tranſmit pure to their poſterity, the religion of the Bible; and finding in this book the leading principles of good government, and a ſyſtem of laws for the general regulation of human conduct, they adopted it as their "principal code of law, and declared, as an article in their bill of rights, that no man ſhould ſuffer but by an expreſs law, ſufficiently publiſhed, yet in caſe of a defect of law in any particular inſtance, *by the word of God.*"

"It is obvious to all in the preſent age, that the peculiarities of the Jewiſh nation muſt render their juriſprudence inapplicable, in a variety of inſtances, to a people ſo differently circumſtanced; and the rights of individuals could gain nothing by neglecting the experience of mankind, in former judicial proceedings, where they were in any degree ſimilar to caſes which might ariſe. The code of laws became marked with many additional capital crimes, unknown as ſuch to thoſe of England; and ſmaller offences were multiplied with rigorous exactneſs. As this ſeverity had for its object, an exemplary purity of morals and religion, which ſhould extend to every perſon in ſociety, it of courſe reached the more private actions of its members, and included all the relationſhips ſubſiſting between them.

"Their capital offences were idolatry, witchcraft, blaſphemy, murder, beſtiality, ſodomy, adultery, manſtealing, bearing falſe witneſs, conſpiracy and rebellion, curſing, or ſmiting a parent, unleſs when neglected in education, or provoked by extreme and cruel correction, rebellious and ſtubborn conduct in a ſon diſobeying the voice and chaſtiſement of his parents, and living in notorious crimes, rape, and arſon; other offences were alſo made capital upon a ſecond or third conviction, and the degree of the offence was in ſome inſtances increaſed by the circumſtance of its being committed on the Sabbath.

"In the inferior claſſes of crimes were many peculiar to the ſituation of the colony, eſpecially with regard to ſumptuary regulations, and the enforcing of induſtry. In theſe there are ſtrong proofs of the diſpoſition which prevailed, of ſhewing reſpect to particular deſcriptions of families by diſtinctions in their favour.

Their puniſhments bore a reſemblance to the general rigour of their penal code, and were ſometimes, even in capital caſes left to the diſcretion of their judges. There is a law on the ſubject of torture, which is a ſtain rather upon the volume in which it is recorded, than upon the practice of the country; to the honour of which it may be ſaid, that the uſe of this ſtatute has been ſo little contemplated, that it became wholly obſolete. This law prohibits torture generally, but excepts any caſe in which the criminal is firſt fully convicted, by clear and ſufficient evidence; after which, if it be apparent from the nature of the caſe, that there be confederates with him, he may be tortured, yet not with ſuch tortures as are barbarous and inhuman. The very terms of this ſtatute ſeem to diſarm it of the power of injuring, and would render it, if it were in force, a leſs dreadful engine of inhumanity than the *peine forte et dure* of the Engliſh law. The rigour of juſtice extended itſelf as well to the protection of the rights of property, as to the moral habits of the people; and a remarkable inſtance of this is ſhown in the power given to creditors, over the perſons of their debtors. The law admitted of a freeman's being ſold for ſervice to diſcharge his debts, though it would not allow of the ſacrifice of his time, by his being kept in priſon unleſs ſome eſtate was concealed.

"The governor and aſſiſtants were the firſt judicial court; to this, inferior juriſdictions were added; and upon the houſe of repreſentatives coming into exiſtence, the judicial authority was ſhared by them, as in the words of their law, the ſecond branch of the civil power of this commonwealth. The ſubordinate juriſdictions, were the individual magiſtrates, the commiſſioners of towns and the county courts. Theſe ſeem in ſome ſenſe to have acted as the deputies of the general court, ſince, in difficult points, they were allowed to ſtate the caſe without the names of the parties, to that court, and receive its declaration of the law.

"The perpetual controverſy incident to dividing power among ſeveral orders, diſproportionate in their numbers, took place between the aſſiſtants and repreſentatives. Whether they ſhould vote in ſeparate bodies or collectively, became a ſerious diſpute. As by a defect in the conſtitution they held both legiſlative and judicial authority; it was at laſt compromiſed, that in making the laws, the two houſes ſhould vote ſeparately, with a negative upon each other; but in trying cauſes, in caſe they ſhould differ in this mode, they ſhould proceed to determine the queſtion by voting together.

"As in their government, hereditary claims were rejected, their public officers being all periodically choſen from the body of the freemen, and without regard to diſtinct orders, ſo in the deſcent and diſtribution of real or perſonal eſtates of inteſtates, the excluſive claim of any one heir was not admitted, but equal diviſion was made among all, reſerving only to the eldeſt ſon a double portion. This, eſpecially in caſe of a numerous family, which is not an uncommon inſtance in a young country, effectually prevented the undue accumulation of property. Theſe two regulations may be ſaid to be the great pillars on which republican liberty in Maſſachuſetts is ſupported. There was an ineſtimable advantage gained to the cauſe of freedom by a law in 1641, which declares the lands of the inhabitants free from all fines and licences upon alienation, heriots, wardſhips, and the whole train of feudal exactions, which have ſo grievouſly oppreſſed mankind in other parts of the world. They tendered hoſpitality and ſuccour to all chriſtian ſtrangers flying from the tyranny of their perſecutors, or from famine, wars, or the like compulſory cauſe, and intitled them to the ſame law and juſtice as was adminiſtered among themſelves.

But while they have thus ſcrupulouſly regulated the morals of the inhabitants within the colony, and offered it as an aſylum to the oppreſſed among mankind, they neglected not to prevent the contagion of diſſimilar habits, and heretical principles from without. A law was made in the year 1637, that none ſhould be received to inhabit within the juriſdiction, but ſuch as ſhould be allowed by ſome of the magiſtrates; and it was fully underſtood, that differing from the religious tenets generally received in the country, was as great a diſqualification, as any political opinions whatever. In a defence of this order, it is advanced, that the apoſtolic rule of rejecting ſuch as brought not the true doctrine with them, was as applicable to the commonwealth as the church, and that even the prophane were leſs to be dreaded than the able advocates of erroneous opinions."

Minot's continuation p. 24 &c.

Character of the firſt ſettlers of New-England.

The firſt ſettlers of New England were certainly a remarkable people; of a character peculiarly adapted to thoſe important deſigns in providence which they were to fulfil. They were deſtined to plant and ſubdue a wilderneſs, filled with ſavage and ferocious enemies; to lay the foundation of a great empire: and this too under the jealous and unpropitious eye of their parent country. Accordingly they were enterpriſing, brave, patient of labour and ſufferings, and poſſeſſed a firmneſs of ſpirit, and a zeal for religion bordering on enthuſiaſm. They had alſo among them their full proportion of the learned and beſt informed men of that age. A body of men more remarkable for their piety, more exemplary in their morals, more reſpectable for their wiſdom, never before, nor ſince, commenced the ſettlement of any country. What have been conſidered as blemiſhes in their character ſeemed neceſſary in their ſituation. "Leſs rigour would have diſqualified them for diſcharging the heavy duties which they had to perform, and perhaps more liberality would have introduced ſectaries which would have weakened the community by diviſions, and profligates who would have corrupted it by their vices." One of the firſt ſtateſmen in America,* has thus characteriſed the fathers of New England. "Religious, to ſome degree of enthuſiaſm, it may be admitted they were, but this can be no peculiar derogation from their character, becauſe it was at that time almoſt the univerſal character, not only of England, but of Chriſtendom: had this however been otherwiſe, their enthuſiaſm, conſidering the principles on which it was founded, and the ends to which it was directed, far from being a reproach, was greatly to their honour. For I believe it will be found univerſally true, that no great enterprize for the honour, or happineſs of mankind, was ever atchieved, without a large mixture of that noble infirmity. Whatever imperfections may be juſtly aſcribed to them, which however are as few as any mortals have diſcovered, their judgment in forming their policy was founded on wiſe and benevolent principles; it was founded on revelation and reaſon too; it was conſiſtent with the beſt, greateſt, and wiſeſt, legiſlators of antiquity."

Minot.

New-Hampſhire and Maine ſettled.

In the years 1621 and 1622, captain John Maſon, and Sir Ferdinando Gorges, obtained grants of the Plymouth Council, (of which they were the moſt active members) of all the country between Naumkeag, (now Salem) and Sagadahock river; and back to the Lakes of Canada. The tract between Naumkeag and Merrimack, which was granted to Maſon, he called *Mariana.* The reſt, granted jointly to both they named *Laconia.*

The next year (1623), they planted a colony, and eſtabliſhed a fiſhery on Piſcataqua river. About the ſame time a variety of other little ſettlements were formed, on the coaſt between the Merrimack and Sagadahock rivers. But none of them flouriſhed, being "rather temporary eſtabliſhments for traffick than ſeed plots of future plantations." So ſlow was the progreſs of the ſettlements in this part of New England, that fifteen years after their commencement, (in July 1638,) when Joſſelyn ſailed along this coaſt, he ſaw, he obſerves, "no other than a mere wilderneſs, here and there by the ſea ſide, ſcattered plantations with a few houſes."

In 1629 the ſoutheaſtern part of the preſent ſtate of New Hampſhire was purchaſed of the Indians, and a deed obtained of them by John Wheelwright and others from Maſſachuſetts. The ſame year captain Maſon procured a new patent from the council of Plymouth, for a ſtill larger tract, including this Indian purchaſe. This tract was now named NEW HAMPSHIRE.

For ſeveral years after this, the adventurers paid very little attention to agriculture. They imported their bread corn from England and Virginia. Their views were chiefly turned to the diſcovery of the lakes, and of mines, to the cultivation of grapes, to the peltry trade, and the fiſheries. The peltry trade was of ſome value, and the fiſheries ſupported the inhabitants, but neither lakes nor mines were found, and the vines which they planted periſhed. Diſcouraged by ill ſucceſs, the adventurers in England ſold their ſhares to Maſon and Gorges, who, in conſequence, became the ſole proprietors. They in 1634 renewed their exertions to increaſe the colony, and appointed Francis Williams, a wiſe and popular man, its Governor.

An attempt was made by Maſon and Gorges about this time, to divide New England into twelve Lordſhips, under the direction of a general governor. This ſcheme was countenanced at Court, but was never adopted, and produced no material injury to the rights of the ſettlers.

The religious views and ſentiments of Maſon and Gorges, did not accord with thoſe of the planters of Maſſachuſetts;—the object of the latter was to eſtabliſh a chriſtian community, for the preſervation and ſpread of pure religion, and liberty of conſcience; while that of the former was to plant colonies, which ſhould yield them wealth and power. The enterprize of Maſon and Gorges was, however, at this period, exemplary and uſeful, as it ſerved to excite a ſpirit of emulation in other adventurers, and their memory deſerves reſpect. Captain Maſon died in the winter of 1635-6. Governor Winthrop in his Journal makes the following remark on his death, evincive of the temper of thoſe times. "He was the chief mover in all attempts againſt us, (the Maſſachuſetts colony) and was to have ſent the general governor; and for this end was providing ſhips. But the Lord, *in mercy*, took him away, and all the buſineſs fell on ſleep."

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* John Adams, late Preſident of the U. States.

New-England.

In April 1639, Gorges obtained from Charles I. a confirmation of his patent, and "his limits were now extended to one hundred miles from the rivers ſouthweſtward into the deſert." This tract was called Maine. By this patent Gorges was inveſted with all the royal rights of a Count palatinate—with greater powers than had ever been granted by a ſovereign to a ſubject. Encouraged by theſe attentions, and inveſted with authority, the following year he eſtabliſhed civil government within the province, appointed Joſſelyn and others his counſellors, and tranſmitted to them (March 1640) ordinances to regulate them in the adminiſtration of juſtice. But he poſſeſſed not the talents requiſite to the government of a colony; the Conſtitution he had formed for Maine, was merely executive, without any legiſlative powers, nor did it provide any aſſembly in which the people might be repreſented. Encouragement was not given to emigrants to purchaſe and cultivate his lands. Agriculture was neglected. Lands were granted, not as freeholds, but by leaſes, ſubject to quit-rents, and no proviſion was made for the regular ſupport of the clergy. With ſuch a government and ſuch regulations, it could not be expected that the colony would flouriſh; on the contrary "the province languiſhed for years in hopeleſs imbecility; and its languors ceaſed, and a principle of life was infuſed, only when he ceaſed to be its proprietary and lawgiver." The town of York, however, was incorporated by him, with city privileges, in 1641, though this circumſtance ſeems to have added neither to its wealth nor importance.

Exeter ſettled.

Religious diſſentions were excited about this time in Maſſachuſetts by the introduction of Antinomian principles. At the head of thoſe who embraced theſe ſentiments was the Rev. John Wheelwright, brother of the famous Ann Hutchinſon, who, finding oppoſition too powerful, quitted Maſſachuſetts, and with a number of his followers, planted the town of Exeter. Senſible of the neceſſity of government and laws, of which they were deſtitute, thirty-five perſons, in October 1639, "combined themſelves in the name of Chriſt, to erect ſuch a government as ſhould be agreeable to the will of God." They conſidered themſelves as ſubjects of England, acknowledged the laws of the realm, and promiſed obedience to ſuch laws as ſhould be made by their own repreſentatives, and choſe a Mr Underhill for their governor. Their ſituation, however, was neither happy nor proſperous.

Not long after a ſmall, but more reſpectable number of perſons from England, ſettled at Dover, and in October 1640, theſe people, and thoſe who had planted themſelves at Portſmouth under Williams, formed themſelves, each, into a body politic, after the example of their neighbours at Portſmouth.

Four diſtinct governments, (including one at Kittery on the north ſide of the river) were now formed on the ſeveral branches of the Piſcataqua. Theſe combinations being only voluntary agreements, liable to be broken or ſubdivided on the firſt popular diſcontent, there could be no ſafety in the continuance of them. The diſtractions in England, at this time, had cut off all hope of the royal attention, and the people of the ſeveral ſettlements were too much divided in their opinions to form any general plan of government, which could afford a proſpect of permanent utility. The more conſiderate perſons among them, therefore, thought it beſt to treat with Maſſachuſetts, about taking them under their protection. That government was glad of an opportunity, to realize the conſtruction which they had put upon the clauſe, of their charter, wherein their northern limits are defined: for a line drawn from eaſt to weſt at the diſtance of "three miles to the northward of Merrimack river, and of any and every part thereof," will take in the whole Province of New-Hampſhire, and the greater part of the Province of Maine, ſo that both Maſon's and Gorges' patents muſt have been vacated. They had already intimated their intention to run this eaſt and weſt line, and preſuming on the juſtice of their claim, they readily entered into a negociation with the principal ſettlers of Piſcataqua reſpecting their incorporation with them. The affair was more than a year in agitation, and was at length concluded by an inſtrument ſubſcribed in the preſence of the general court, by George Wyllys, Robert Saltonſtall, William Whiting, Edward Holiock, and Thomas Makepeace, in behalf of themſelves and the other, partners of the two patents; by which inſtrument they reſigned the juriſdiction of the whole to Maſſachuſetts, on condition that the inhabitants ſhould enjoy the ſame liberties with their own people, and have a court of juſtice erected among them. The property of the whole patent of Portſmouth, and of one third part of that of Dover, and of all the improved lands therein, was reſerved to the lords and gentlemen proprietors, and to their heirs forever. Belknap.

Thus New-Hampſhire ceaſed to be a ſeparate province. Each of the aſſociations before mentioned diſſolved their reſpective compacts, which had been productive of much contention and anarchy, and peaceably ſubmitted to Maſſachuſetts.

Settlement of Connecticut.

In the year 1631, Wahquimacut, a ſachem of one of the tribes upon the Connecticut river, viſited the governors of Maſſachuſetts and Plymouth, and earneſtly beſought them to make a ſettlement upon that river. Wahquimacut was induced to make this requeſt from a hope that the Engliſh might protect him and his nation againſt the Pequods, who, from their number, and power, threatened to exterminate the river tribes. To perſuade the Engliſh to comply with his requeſt, he repreſented to them the fertility of the country, and its advantages for trade, and promiſed to give them eighty beaver ſkins, and an annual ſupply of corn. Mr Winthrop, the governor of Maſſachuſetts, was not inclined to accept the offer.—Mr Winſlow, the governor of Plymouth, thought it worthy of conſideration, and, that he might judge of the truth of the ſachem's repreſentations, viſited the river in the latter part of this year.

In 1632, a more particular examination of the river and adjoining territories was made by the people of New Plymouth, with a deſign to fix upon a proper ſite for a trading houſe. Having found a ſuitable ſituation, they endeavoured to engage governor Winthrop and his council to unite with them in this new ſettlement; but not having ſucceeded in this attempt, they reſolved by themſelves to undertake it. Accordingly in October 1633, William Holmes of Plymouth, with a ſmall company of men, ſailed up the Connecticut; and notwithſtanding the threats of the Pequods, and of the Dutch, who had lately built a ſmall fort at Hartford, erected a trading houſe a ſhort diſtance below the mouth of the little river in Windſor. This was the firſt houſe that was erected in Connecticut. The Engliſh, thus eſtabliſhed, treated the Indians with juſtice and kindneſs; and the Indians in return teſtified to them, in every poſſible manner, affection and good will. The fierce and high ſpirited Pequods were the only people who refuſed this interchange of good offices, and who thus early manifeſted a deep animoſity towards the Engliſh. In 1634, the inhabitants of Dorcheſter, Watertown, and Newtown, applied to the general court of Maſſachuſetts for permiſſion to remove to Connecticut. After warm and long debates, this permiſſion was refuſed. Nevertheleſs the body of the people of Dorcheſter, and of the towns of Newtown, Cambridge and Watertown, concluded to remove.

Hiſt. Col. for 1798, p. 167.

In the ſummer of 1635, they performed the dangerous and laborious journey acroſs the wilderneſs to Connecticut river. At the time of their removal, the Dutch had extended their claim, to the river, and made a ſettlement a few miles below Windſor. The fortitude of thoſe pious adventurers was truly wonderful. About one hundred men, women, and children, took their departure from the three towns beforementioned, to travel through an unexplored wilderneſs. They were fourteen days performing the tedious journey. The wilderneſs, through which they paſſed, for the firſt time reſounded, with the praiſes of God. They prayed, and ſang pſalms and hymns as they marched along; the Indians following and looking on them in ſilent admiration.

They arrived at this river, the object of their ardent expectation, near the mouth of Scantic river in Eaſt Windſor. The Dorcheſter people, with Mr Wareham for their miniſter, began the ſettlement of Windſor on the weſt ſide of the river; they ſuffered great hardſhips the firſt winter, and their cattle periſhed for want of food; for to carry much proviſion or furniture through a pathleſs wilderneſs was impracticable. Their principal proviſions and houſehold furniture had been put on board ſeveral ſmall veſſels, which, by reaſon of delays, and the tempeſtuouſneſs of the ſeaſon, were either caſt away, or did not arrive. Several veſſels were wrecked on the ſhore of New-England, by the violence of the ſtorms. Every reſource appeared to fail, and the people were under the dreadful apprehenſions, of periſhing by famine. They ſupported themſelves in this diſtreſſing period with that heroic firmneſs and magnanimity, for which the firſt ſettlers of New-England had been ſo eminently diſtinguiſhed.

Trumbull's Hiſt. Conn.

The Indians on, and near, the river were numerous. Three Sachemdoms were in the vicinity. The ſeat of one was near the mouth of Podunck river, lying in the ſouthweſt corner of Eaſt Windſor. A ſecond at Middletown, twenty miles below; and the third at Farmington, about twelve miles weſt of Windſor.

Some of the firſt ſettlers of Windſor were gentlemen of opulence and education, as were alſo thoſe of Hartford and Weatherſfield, which ſettlements were begun at the ſame time. The right of ſettling here they purchaſed of the old Plymouth company in England, and they paid the Indians for the ſoil. They had ſent ſome men the year preceding their removal, to make the purchaſe of the natives, whom they looked upon as the only rightful proprietors. (For the remainder of the hiſtory of Connecticut, ſee article CONNECTICUT, Vol. I. of this Work.)

Settlement of Rhode-Iſland.

Motives of the ſame kind with thoſe which are well known to have occaſioned the ſettlement of moſt of the other United States, gave birth to the ſettlement of Rhode-Iſland. The emigrants from England, who came to Maſſachuſetts, though they did not perfectly agree in religious ſentiments, had been tolerably united by their common zeal againſt the ceremonies of the Church of England. But as ſoon as they were removed from eccleſiaſtical courts, and poſſeſſed a charter allowing liberty of conſcience, they fell into diſputes and contentions among themſelves; and, notwithſtanding all their ſufferings and complaints in England, excited by the principle of uniformity, (ſuch is human nature) the majority here were as fond of this principle as thoſe from whoſe perſecution they had fled.

The true grounds of religious liberty were not embraced at this time, nor underſtood by any ſect. While all diſclaimed perſecution for the ſake of conſcience, a regard for the public peace, and the preſervation of the Church of Chriſt from infection, together with the obſtinacy of the heretics, was urged in juſtification of that, which, ſtripped of all its diſguiſes, the light of nature, and the laws of Chriſt, in the moſt ſolemn manner condemn.

Mr Roger Williams, a Puritan miniſter, came over to New-England in 1631, and ſettled at Salem, aſſiſtant to the Rev. Mr Skelton. His ſettlement was oppoſed by the magiſtrates becauſe he refuſed to join with the church, at Boſton, unleſs they would make a public declaration, of their repentance for maintaining communion with the church of England, while in their native country. In conſequence Mr Williams removed to Plymouth where he remained aſſiſtant to Mr Smith, three years; when he diſagreed with ſome influential characters in that town, and by invitation returned to Salem and ſucceeded Mr Skelton who had lately deceaſed. His ſettlement was ſtill oppoſed by the magiſtrates, who charged him with maintaining, "That it is not lawful for a godly man to have communion in family prayer, or in an oath, with ſuch as they judge unregenerate;" therefore he refuſed the oath of fidelity, and taught others to follow his example; "that it is not lawful for an unregenerate man to pray; that the magiſtrate has nothing to do in matters of the firſt table; that there ſhould be a general and unlimited toleration of all religions; that to puniſh a man for following the dictates of his conſcience was perſecution; that the patent which was granted by king Charles was invalid, and an inſtrument of injuſtice which they ought to renounce, being injurious to the nations, the king of England having no power to diſpoſe of their lands to his own ſubjects." On account of theſe ſentiments, and for refuſing to join with the Maſſachuſetts churches, he was at length baniſhed the colony, as a diſturber of the peace of the church and commonwealth.

Miſs Adams' Hiſt. New-England.

He left his houſe, wife and children at Salem in the dead of winter, and ſought a reſidence within the limits of Maſſachuſetts.—Fortunately for Mr Williams, he had cultivated an acquaintance with the Indians, and learned their language, and before he left the colony, he had privately treated with Canonicus and Oſamaquin, two Narraganſet ſachems, for a tract of land within their territories, provided he ſhould be under the neceſſity of ſettling among them. Theſe circumſtances, together with the advice of governor Winthrop induced him, with four of his friends, after his baniſhment, to direct his courſe towards Narraganſett Bay. He with his companions eſtabliſhed themſelves firſt at Secunk, or Seekhonck, now Rehoboth. But that place being within the bounds of Plymouth colony, governor Winſlow, in a friendly manner, adviſed them to remove to the other ſide of the river, where the lands were not covered by any patent. Accordingly in 1636, they croſſed Seekhonk river, and landed among the Indians, by whom they were hoſpitably received, and thus laid the foundation of a town which, "from a ſenſe of God's merciful providence to him in his diſtreſs," Mr Williams called Providence. Here the little colony were ſoon after joined by a number of others, and though they were ſecured againſt the Indians by the terror of the Engliſh, yet, for a conſiderable time, they ſuffered much from fatigue and want; but they enjoyed liberty of conſcience, and the conſolation of having "provided a refuge for perſons perſecuted for conſcience ſake."

Unhappy religious diſſentions ſtill prevailed in Maſſachuſetts; and from a miſtaken zeal for the purity of the faith, governor Winthrop ſtrove to exterminate the opinions which he diſapproved. For this purpoſe, on the 30th of Auguſt 1636, a ſynod was convened at Newtown (now Cambridge) to whom eighty erroneous opinions were preſented; theſe were debated and condemned. At a court holden at the ſame place, the following October, a few of the leading characters who had embraced theſe errors were baniſhed, and ſeveral others were cenſured for ſeditious conduct. Theſe tranſactions threw the Maſſachuſetts colony into a ferment. The ſubſequent election of civil officers was carried by a party ſpirit excited by religious controverſy. Thoſe who were baniſhed by the court, joined by a number of their friends, left the colony, and went in queſt of a new place for ſettlement. They firſt proceeded to Providence, where they were kindly received by Mr Williams, and with whom they remained for ſome time. In March 1638, two Sachems, by virtue of their authority, and in conſideration of fifty fathoms of white beads, ſold to Mr Coddington (one of the moſt reſpectable of theſe exiles) and his aſſociates, the great iſland of Aquidneck, and the other iſles in Narraganſet bay, except two which had been previouſly ſold. The natives ſoon after agreed upon receiving ten coats and twenty hoes, to remove before the next winter. The largeſt iſland was ſoon after called Rhode-Iſland. Having thus acquired a title and poſſeſſion on conſiderations which gave ſatisfaction to the original owners, they here eſtabliſhed themſelves; and copying the conduct of their neighbours, they formed a ſimilar aſſociation for the purpoſes of civil government. Though the numbers aſſociated were few, yet the ſoil being fruitful, and the climate agreeable, many perſons ſoon reſorted where they found protection, and the iſland, in a few years, became ſo populous as to ſend out coloniſts to the adjacent ſhores.—The little colony elected Mr Coddington their judge and chief magiſtrate. This gentleman came to America in 1630, and ſettled at Boſton as a merchant. After his removal to Rhode-Iſland, he embraced the ſentiments of the Friends, and became the father of that denomination of Chriſtians in that colony. Their Yearly-meeting was held in his houſe till his death in 1688. Mr John Clarke was another principal character among the exiles; for the ſake of enjoying liberty of conſcience, he voluntarily abandoned the colony of Maſſachuſetts and ſettled in Rhode-Iſland, where, in 1644, he founded a Baptiſt Church.

Rhode-Iſland purchaſed and planted.

The firſt ſettlement on Rhode-Iſland was made at the north end, and called Portſmouth. In 1639, another ſettlement was begun at the ſouth-weſt part of the iſland on a fine harbour, which they called Newport. From the convenience of this harbour, the fertility and pleaſantneſs of the iſland, and the wealth of the firſt ſettlers, this place had a rapid growth, and in a few years became the capital of the colony. The government which they eſtabliſhed was of the democratic kind. The chief magiſtrate and four aſſiſtants were inveſted with part of the executive powers; the remainder with the legiſlative authority was exerciſed by the body of the people in town meetings.

The colonies at Providence and Rhode-Iſland at different periods received large acceſſions from the denominations of Baptiſts and Friends who were perſecuted in other colonies. What diſtinguiſhes theſe colonies from all others is, that they were ſettled on a "plan of entire religious liberty; men of every denomination being equally protected and countenanced, and enjoying the honours and offices of government." Belknap.

The inefficacy of a voluntary government and the want of a patent to legalize their proceedings, was ſoon experienced by the coloniſts at Providence and Rhode-Iſland. Accordingly, in the year 1643, they ſent Mr Roger Williams to England, as their agent, to procure for them a charter from the Crown. On his arrival at London, he found that King Charles I. had been driven from his capital; he of courſe applied to thoſe who had aſſumed the power. Sir Henry Vane, his former aſſociate and friend in America, received him kindly, and aided his views. In March 1644, through the Earl of Warwick, then governor and admiral of all the plantations, he obtained from Parliament, "a free and abſolute charter of civil incorporation of Providence plantations in Narraganſet bay," inveſting the inhabitants with the requiſite authority to govern themſelves, but according to the laws of England.

Mr Williams was well received by ſome of the leading members of Parliament, and when he was about to embark for America they gave him a letter of recommendation to the governor and aſſiſtants of Maſſachuſetts, in which they repreſented the merits of Mr Williams, and adviſed to the performance of all friendly offices towards him. This letter had the effect to ameliorate the differences which had ſubſiſted between Mr Williams and the Maſſachuſetts colony; and there was afterwards a profeſſion of chriſtian love and mutual correſpondence between them. Yet, while Williams retained what were deemed dangerous principles, the governor and aſſiſtants of Maſſachuſetts thought it inexpedient to grant him liberty of ingreſs and egreſs, leſt the people ſhould be drawn away with his erroneous opinions.

When in 1643, the dangers and neceſſities of the New-England colonies induced them to think of forming a confederacy for their mutual ſupport and defence, Providence and Rhode-Iſland plantations were deſirous of uniting in the plan; but Maſſachuſetts, diſliking their

Rhode-Iſland refuſed admiſſion into the colonial confederacy of 1643.

their religious ſentiments, oppoſed their motion, and refuſed them a ſeat in the convention for forming the confederacy. Thus forſaken of their neighbours, they found it neceſſary to deviſe other means of ſafety. They accordingly cultivated the friendſhip of the neighbouring Sachems, with aſſiduity and ſucceſs, and in a ſhort time acquired ſuch an influence with them as to procure from the Narraganſett chiefs, in 1644, a formal ſurrender of their country to King Charles I. in right of his crown, in conſideration of his protection of them againſt their enemies. This territory was afterwards called *the King's Province*.

The Narraganſet Indians ſurrender their country to the king of England.

The people of theſe plantations, thus empowered to manage their own affairs, in the true ſpirit of democracy, convened an aſſembly in May 1647, compoſed of the body of freemen, in the ſeveral plantations. Several ſalutary regulations were adopted. The executive power, by this aſſembly, was veſted in a preſident. This form of government, ſo agreeable to their inclinations and views, they did not long enjoy in tranquillity. It was ſuſpended in October, 1652, by an order of the council of ſtate for the Commonwealth. The Parliament wiſhed to acquire a participation, at leaſt, in the adminiſtration of affairs, by eſtabliſhing here thoſe plans of reformation which they attempted in Maſſachuſetts, and which they actually effected in Virginia and Maryland. But Providence and Rhode-Iſland, deriving the ſame advantages from the diſtractions which ſoon after enſued in England, that the colonies have always taken of the diſorders of the ſovereign ſtate, reſumed its form of government: And this it continued to enjoy without farther interruption, till the Reſtoration.

Charles II. proclaimed, and a patent obtained.

That event gave great ſatiſfaction to theſe plantations. They immediately proclaimed Charles II. and not long after ſent Mr Clarke, as their agent, to the court of that monarch, to ſolicit for a patent, which was deemed in New-England ſo eſſential to real juriſdiction: and in Sept. 1662, he obtained the object of his wiſhes. Yet, owing to the oppoſition of Connecticut, the preſent charter was not finally paſſed till July 1663. The immigrations, before mentioned, from Maſſachuſetts, and the ſubſequent ſettlements at Providence and Rhode-Iſland, were recapitulated; "which being convenient for commerce," ſays the patent, "may much advance the trade of this realm, and greatly enlarge the territories thereof:" and being willing to encourage the undertaking of his ſubjects, and to ſecure to them the free enjoyment of their civil and religious rights, which belonged to them as Engliſhmen, he conferred on them ample liberty in religion, and ſpecial privileges with regard to juriſdiction. The patentees, and ſuch as ſhould be admitted free of the ſociety, were incorporated by the name of "The governor and company of the Engliſh colony of Rhode-Iſland and Providence." The ſupreme, or legiſlative power, was inveſted in an aſſembly; the conſtituent members were to conſiſt of the governor, the aſſiſtants, and ſuch of the freemen as ſhould be choſen by the towns; but the governor or deputy governor, and ſix aſſiſtants were to be always preſent. Thus conſtituted, the aſſembly was empowered to make ordinances, and forms of government and magiſtracy, for the rule of the lands and inhabitants; ſo that they ſhould not be repugnant, but agreeable to the laws of England, conſidering the nature of the place and people; to erect ſuch courts of juſtice for determining all acts within the colony, as they ſhould think fit; to regulate the manner of elections to places of truſt, and of freemen to the aſſembly; to impoſe lawful puniſhments, pecuniary and corporal, according to the courſe of other corporations within the realm; and to pardon ſuch criminals, as they ſhould think fit. That the inhabitants might be religiouſly and civilly governed, a governor, deputy governor and ten aſſiſtants were appointed for the management of their affairs; and they were authoriſed to execute the ordinances before mentioned, which every one was commanded to obey. The governor and company were enabled to tranſport ſuch merchandize and perſons, as were not prohibited by any ſtatute of the kingdom; and "paying ſuch cuſtoms as are, and ought to be paid for the ſame:" They were empowered to exerciſe martial law, and upon juſt cauſes, to invade and deſtroy the native Indians and other enemies. There was granted to the governor and company, and their ſucceſſors, "that part of the dominions of the Crown, in New-England, containing the iſlands in Narraganſet bay, and the countries and parts adjacent: To be holden of the manor of Eaſt Greenwich, in common ſoccage." The inhabitants of thoſe territories and their children, were declared fully intitled to the ſame immunities, as if they had reſided or had been born within the realm; and to guard againſt the experienced oppreſſions of Maſſachuſetts, they were enabled to paſs and repaſs through any other Engliſh colonies, and to traffic with them. But with this proviſo, that nothing ſhould hinder any ſubjects whatſoever from fiſhing on the coaſts of New-England. Chalmers.

Its contents.

Such was the ſubſtance of the charter of Rhode-Iſland, and ſuch were the privileges conferred by it. The government of this Province was adminiſtered to the ſatiſfaction of Charles II. during the remainder of his reign. By the charter of this province "None were at any time thereafter to be moleſted, for any difference in matters of religion," yet the firſt aſſembly that convened under this charter, in March 1663, among a variety of other ordinances and laws, enacted one declarative of the privileges of his majeſty's ſubjects; in which they ſay, "that all men of competent eſtates and of civil converſation, *Roman Catholics only excepted*, ſhall be admitted freemen, or may chooſe, or be choſen, colonial officers." By this act, perſecution of the Roman Catholics immediately commenced, by depriving them of the rights of citizens, in violation of their charter privileges. This is a remarkable fact in the hiſtory of a people who have been ſingular for their attachment to, and zealous in defending, the doctrine of univerſal freedom of opinion in matters of religion.

Roman Catholics barred from the privileges of freemen.

Upon the acceſſion of James II. to the throne, the coloniſts of Rhode-Iſland and Providence immediately tranſmitted to him an addreſs, in which they acknowledged their ſubjection to him, pledged themſelves to obey his authority, and aſked in return for the protection of their chartered privileges.—This addreſs did not, however, avail to protect them againſt the effects of the plans of reform in New-England, reſolved on by the Britiſh court. Articles of "high miſdemeanor were exhibited to the Lords of the Committee of Foreign Plantations, againſt the governor and company

Articles of charge exhibited againſt the governor and company, and a writ of *quo warranto* iſſued.

Chalmers.

of the colony of Rhode-Iſland and Providence," in which, among other things, they are charged with neglecting to keep an authentic record of their laws; with refuſing to permit the inhabitants to have copies of them, with razing or cancelling their laws as they pleaſe, without conſent of the aſſembly, and with adminiſtering the government, and juſtice, without taking the legal oaths. Theſe charges were referred to the attorney general, July 1685, with orders immediately to iſſue a writ of *quo warranto* againſt their patent. The governor and company were ſerved with a regular notice of the proceſs, which had been iſſued againſt them, and they were put upon their defence; they declined ſtanding a ſuit with their king. In full aſſembly, they paſſed an act formally ſurrendering to his majeſty their charter, with all the powers it contained. This act, it is ſaid, "was afterwards made way with, agreeably to a common practice." The governor and company afterwards aſſembled, and on ſerious conſiderations of the ſuit inſtituted againſt them, agreed upon an addreſs to his majeſty, in which they pray that their charter privileges, civil and religious, might be continued; that "all things wherein they have been weak and ſhort, through ignorance, may be remitted and pardoned." They conclude by "proſtrating their *all* at his majeſty's feet, with entire reſolution to ſerve him with faithful hearts." Such ſervile language was improper for freemen to uſe, or for the ruler of a free people to receive. It failed of its intended effect. No ſooner was the addreſs received than the committee of the colonies, with the approbation of the king, ordered, that Sir Edward Andros, the governor of Maſſachuſetts, ſhould demand the ſurrender of their charter, and govern them in the manner the other colonies of New England were governed. At the ſame time they were aſſured of his majeſty's protection, and of his determination to exerciſe no other authority over them than what was common to the other plantations. Accordingly, in December 1686, Andros formally diſſolved the government of Rhode-Iſland, broke their ſeal, aſſumed the reins of government, and ſelected five of the citizens and formed them into a legiſlative council. This ſtate of things continued ſcarcely two years, when the revolution of 1688, put an end to the tyrannic authority of Andros, in this, and the other colonies. Their charter was reſumed, and has ever ſince continued to be the baſis, of the civil adminiſtration of their government.

Charter ſurrendered to Sir Edward Andros.

Earthquake.

The year 1638 was remarkable for a great earthquake throughout New England. This earthquake, as did that alſo of 1627, which was equally violent and extenſive, conſtituted a remarkable era, which was long remembered and referred to by the pious inhabitants of theſe infant colonies.

Harvard College founded.

Great praiſe is due to the fathers of New England for their early attention to the education of children and youth. In 1636, the general court granted 400*l.* towards the eſtabliſhment of a public grammar ſchool at Newtown, (ſince called Cambridge.) Two years after, the Rev. JOHN HARVARD, a worthy miniſter of Charleſtown, died and bequeathed one half of his eſtate, amounting to a little upwards of 1800 dollars to this infant ſeminary; in conſequence of which, the general court gave it the name of HARVARD COLLEGE. Under the patronage of the legiſlature, and by frequent and liberal benefactions from the pious wealthy and generous friends of ſcience, this inſtitution ſoon roſe into reſpectability and has ſince been the ſource of incalculable benefit to New England.

Amount of original ſtock whence New-England was peopled.

In 1640, in conſequence of a change of affairs in the mother country, emigration to New England ceaſed. It was eſtimated at the time, that about 4000 families, conſiſting of 21,000 ſouls, had arrived in 298 ſhips, and ſettled in this new world. Since this period there can be no doubt, many more perſons have migrated *from*, than *to* New England. The expence of the removal of theſe 4000 families was eſtimated at 192,000*l.* ſterling, which, including what they paid to the council of Plymouth, and afterwards to the ſachems of the country, was a dear purchaſe of their lands.

Confederation of the colonies.

Expoſed to foreign and domeſtic enemies, four of the New England colonies, *viz.* Maſſachuſetts, Plymouth, Connecticut, and New-Haven, confederated for mutual defence. Rhode-Iſland, as we have before noticed, was denied the privilege of joining this confederacy. The articles of union were agreed on and ratified, May 19th, 1643, and were in ſubſtance as follows:

"The united colonies of New England, *viz.* Maſſachuſetts, Plymouth, Connecticut and New Haven, enter into a firm and perpetual league offenſive and defenſive.

Each colony to retain a diſtinct and ſeparate juriſdiction, no two colonies to join in one juriſdiction, without the conſent of the whole; and no other colony to be received into the confederacy without the like conſent.

The charge of all wars, offenſive and defenſive, to be borne in proportion to the male inhabitants between 16 and 60 years of age in each colony.

Upon notice from three magiſtrates, of any colony, of an invaſion, the reſt ſhall immediately ſend aid; Maſſachuſetts 100, and each of the other, 45 men; and if a greater number be neceſſary, the commiſſioners to meet and determine upon it.

Two commiſſioners from each government, being church members, to meet annually the firſt Monday in September; the firſt meeting to be held at Boſton, then at Hartford, New Haven, and Plymouth, and ſo yearly in that order, ſaving, that two meetings ſucceſſively be held at Boſton.

All matters wherein ſix ſhall agree, to be binding upon the whole; and if there be a majority, but under ſix, the matter in queſtion to be referred to the general court of each colony, and not to be obligatory unleſs the whole agree to it.

A preſident, for preſerving order, to be choſen by the commiſſioners each year out of their number.

The commiſſioners ſhall have power to eſtabliſh laws, or rules, of a civil nature, and of general concern for the conduct of the inhabitants, *viz.* relative to their behaviour towards the Indians, to fugitives from one colony to another, and the like.

No colony to engage in war, except upon a ſudden exigency, and in that caſe to be avoided as much as poſſible, without conſent of the whole.

If a meeting be ſummoned upon any extraordinary occaſion, and the whole number of commiſſioners do not aſſemble, any four who ſhall meet may determine upon a war when the caſe will not admit of delay, and ſend for the agreed proportion of men out of each juriſdiction; but not leſs than ſix ſhall determine the juſtice of the war, or have power to ſettle bills of charges, or make levies for the ſame.

Hutchinſon.

If any colony break any article of the agreement, or in any wiſe injure another colony, the matter ſhall be conſidered and determined by the commiſſioners of the other colonies.”

Indians chriſtianized.

In 1650 a ſociety in England, inſtituted for propagating the goſpel, began a correſpondence with the commiſſioners of the united colonies, who were employed as agents for the ſociety. In conſequence, exertions were made to chriſtianize the Indians. The Rev. Mr Eliot, miniſter of Roxbury, diſtinguiſhed himſelf in this pious work. He tranſlated the bible into the Indian language, eſtabliſhed a town in which he collected a number of Indian families; taught them huſbandry, the mechanic arts, and a prudent management of their affairs, and inſtructed them with unwearied attention in the principles of the chriſtian religion. His zeal and ſucceſs have juſtly obtained for him the title of the *Apoſtle of New England.*

Quaker perſecution.

The perſecution of the Quakers commenced in 1656, and continued till September 1661, when an order was received from the king, requiring that neither capital nor corporeal puniſhment ſhould be inflicted on the Quakers, but that offenders ſhould be ſent to England. During this perſecution ſeveral were executed. On the ſubject of the New England perſecutions, the author of the European ſettlements in North America, judiciouſly remarks; “Such is the manner of proceeding of religious parties towards each other, and in this reſpect the people of New England were not worſe than the reſt of mankind; nor was their ſeverity any juſt matter of reflection upon that mode of religion which they profeſs. No religion, however true or falſe, can excuſe its own members, or accuſe thoſe of any other, on the ſcore of perſecution.” Religious intolerance is now very generally reprobated, and it is hoped the time has already arrived, when no people can be found who think, “that by killing men for their religion, they do God good ſervice.”

Synod held in Boſton.

By order of the general court a ſynod of the New-England churches convened at Boſton, September 1662. The people were at this time much divided in opinion on the two following queſtions, which were ſubmitted to the ſynod for their deciſion, *viz.* 1*ſt* “Who are the ſubjects of baptiſm?” 2*d* “Whether, according to the word of God, there ought to be a conſociation of churches, and what ſhould be the manner of it?” The general court ordered the reſult of this ſynod, which was not unanimous, to be printed, and it may be ſeen at large in Dr Mather's Magnalia, or in Neal's hiſtory of the Puritans.

Comet.

The people of New England were ſurpriſed by the appearance of a Comet, from the 17th of November, 1664, till the 4th of February following. They deemed it ominous, (as they afterwards did the Aurora Borealis,) of ſome calamity which was ſhortly to befal them.

Indian war.

In the year 1675, a war with the Indians, by the name of *Phillip's war,* broke out, and endangered the exiſtence of the colony. Some doubted whether the Indians would not ſucceed in the total extirpation of the Engliſh. This diſtreſſing war laſted more than a year, and was finally terminated by the death of Phillip, at whoſe inſtigation it was commenced.

Sufferings of the coloniſts.

About this time the coloniſts were afflicted with various and great calamities. While they were contending in a bloody war with the natives, for their lives and their property, complaints were making in England, which ſtruck at the powers of government. An inquiry now commenced which iſſued in the loſs of the charter. At the ſame time Great Britain and Ireland were ſuffering under a prince, hoſtile to civil and religious liberty; and connected as New England was with the mother country, ſhe could not but ſhare, in a greater or leſs degree, in the evils of ſuch a government. Add to theſe, the ſmall pox ſpread through the country, and uncommon loſſes had been ſuſtained by ſea, during the wars which were about this time carrying on againſt the French and Dutch.

Another Synod convened.

In this ſtate of things, a Synod was convened by order of the general court, in May 1679, and two queſtions referred to their conſideration. 1*ſt,* “What are the reaſons that have provoked the Lord to bring his judgments on New England? 2*d,* What is to be done, that thoſe evils may be removed?” The ſolicitude manifeſted on this occaſion, and the meaſures adopted by the fathers of New England, evinced their piety and wiſdom.

Loſs of the charter.

In June 1683, articles of high miſdemeanor were exhibited by Edward Randolph, the public accuſer of thoſe days, againſt the Governor and Company of Maſſachuſetts. In conſequence a writ of *quo warranto* was ordered, and Randolph was appointed to carry it to New England; and to give importance to the meſſenger, and to his meſſage, both of which were extremely obnoxious to the people of Maſſachuſetts, a frigate was ordered to convey him to Boſton. To prevent too great an alarm in the colony, a declaration accompanied the *quo warranto,* that it ſhould affect no private rights. When theſe arrived, the general court deliberated on the critical ſtate of their affairs. The governor, and a majority of the aſſiſtants reſolved to ſubmit to the royal pleaſure, and tranſmitted an addreſs to that effect. But the repreſentatives, ſupported by the deciſive influence of the clergy, refuſed their aſſent. All was ineffectual to preſerve the charter. In Trinity term 1684, judgment was given for the king, by the high court of Chancery, againſt the Governor and Company of Maſſachuſetts, “that their letters, patents, and the enrollment thereof be cancelled.”

Thus ended the ancient government of Maſſachuſetts by legal proceſs. The validity of theſe proceedings was afterwards queſtioned by high authority. The houſe of commons at a ſubſequent period reſolved, “that thoſe *quo warranto's* againſt the charter of New England, were illegal and void.”

State of New-England at this period.

Amidſt all her diſputes with the mother country, New England greatly flouriſhed. Agricultural purſuits were ſucceſsful, manufactures and commerce were extended, and population and wealth were increaſed, becauſe “the rough hand of oppreſſion had not touched the labours of the inhabitants, or interrupted the freedom of their purſuits.” If for a ſhort time the ſplendour of New England independence was obſcured by the clouds of royal authority, it ſoon blazed forth never to be extinguiſhed.

Ten months paſſed after the diſſolution of the charter, when it was thought neceſſary to eſtabliſh a temporary government for the preſervation of order. During this period, James II. aſcended the throne of England, and was proclaimed in Boſton, April 1685, with “ſorrowful and affected pomp.” In September following, a commiſſion was iſſued, appointing a preſident and council, compoſed of the moſt loyal of the inhabitants of the government of Maſſachuſetts, New Hampſhire, Maine, and Narraganſet, till the chief governor ſhould arrive. Col. Dudley, a native of Maſſachuſetts, was appointed preſident.

Dudley appointed preſident.

The people reluctantly ſubmitted to a power which they could not oppoſe; declaring, that "though they could not give their aſſent to it, they ſhould demean themſelves as loyal ſubjects, and humbly make their addreſſes to God, and in due time to their gracious ſovereign, for relief." Counſellors were nominated by the king; no houſe of repreſentatives was mentioned in the commiſſion; ſtill, to reconcile the minds of the people to the intended introduction of a governor general, the courts of juſtice were allowed to remain on their original plan; juries were continued, former laws and cuſtoms were obſerved.

Hutchinſon.

Sir Edmond Andros arrives in Boſton, as Capt. General of New-England.

Before a year of Dudley's adminiſtration had expired, (Dec. 1686) Sir Edmond Andros arrived in Boſton from New-York, where he had been governor, being now appointed Capt. General, and Vice Admiral of Maſſachuſetts, New Hampſhire, Maine, Plymouth, Rhode Iſland and Connecticut, during pleaſure. In 1683, New-York and New-Jerſey were added to his juriſdiction. He with four of his council was empowered to grant lands with ſuch quit-rents as the king ſhould appoint. Like all tyrants, from Nero to the demagogues of the preſent day, Sir Edmond began his adminiſtration with profeſſions of high regard for the public welfare.

The tenor of his adminiſtration.

In the fall of 1689, he went to Hartford where the aſſembly were ſitting, and demanded the charter, declaring their government diſſolved. Remonſtrances were made, and the buſineſs delayed till evening; then, tradition ſays, the charter was brought into the aſſembly, and laid on the table; candles were extinguiſhed, but lighted again. The charter could not be found. All was quiet and peaceable. The charter had been taken by Capt. Wadſworth and concealed in a hollow tree. Still Sir Edmond ſeized the reins of government; turned out the old, and appointed new officers, civil and military.

Turnbull.

Numerous were the oppreſſions of this tyrant. The preſs was reſtrained, liberty of conſcience infringed, and exorbitant taxes levied. The charter being vacated, it was pretended all titles to land were deſtroyed; farmers therefore, who had cultivated their ſoil for half a century, were obliged to take new patents, giving large fees, or writs of intruſion were brought, and 1688. their lands ſold to others. To prevent petitions or conſultations, town meetings were prohibited, excepting one in a year for the choice of town officers. Leſt the cries of oppreſſion ſhould reach the throne, he forbid any perſon to leave the country without permiſſion from the government. But the reſolute Dr Increaſe Mather, eſcaped the watchful governor, and his guards and emiſſaries; croſſed the Atlantic, and ſpread before the king the complaints of New-England. But relief came not till the revolution.

1689. When the report reached Boſton, that the Prince of Orange had landed in England, joy beamed in every eye. Though the governor impriſoned the man who brought the Prince's declaration; though by a proclamation, he commanded all perſons to prepare for an invaſion from Holland; though magiſtrates, and the more conſiderate men were determined quietly to wait the iſſue; yet the indignant ſpirit of the people could not be reſtrained. On the morning of April 18th, the public fury burſt forth like a volcano. The inhabitants of Boſton were in arms; the country flocking to their aſſiſtance. Andros and his aſſociates fled to a fort; reſiſtance was vain; he was made a priſoner, and conducted to England. The charges exhibited againſt him not being ſigned by the colonial agents, he was diſmiſſed, and this tyrant, thus indignantly ſpurned from New England, was appointed governor of Virginia.

Its diſgraceful termination.

Mr Bradſtreet, the late governor, with thoſe who had been magiſtrates under the charter, aſſumed the government, taking the name of a "Council of Safety," till new orders ſhould arrive from England. Theſe were ſhortly after received from King William, who, with his Queen Mary, were proclaimed in Boſton May 29th 1689, with more ceremony than had ever been known in that colony on the like occaſion. The revolution in Boſton was popular in New Hampſhire, but they found themſelves in a very unſettled ſtate. After waiting in vain for orders from England, they choſe deputies to agree on ſome mode of government, and finally determined to return to their ancient union with Maſſachuſetts.

William and Mary proclaimed in Boſton.

In 1692, Samuel Allen obtained a commiſſion for the government of New Hampſhire. Having purchaſed of Maſon's heirs the lands of the colony, they were embroiled with new controverſies for ſeveral years.

Indian war.

Previous to this, in 1688, an Indian war broke out in New England; various were the provocations plead by the natives in their juſtification. They charged the Engliſh with ſtopping the fiſh in Saco river; with not paying the tribute of corn ſtipulated in a former treaty; with turning cattle upon their corn; with granting away their lands, and cheating them in trade. The firſt blood was ſhed at North Yarmouth, in September. In the ſpring the Penicook Indians joining thoſe of Saco, they made a dreadful ſlaughter at Cocheco. Meſandouit being hoſpitably lodged at Major Waldron's, in the night opened the gate, and a hundred, ſome ſay five hundred, Indians ruſhed into the garriſon, murdered the Major, and 22 others, took 29 priſoners, burned 4 or 5 houſes, and fled loaded with plunder. The captives were ſold to the French in Canada. In Auguſt they took the fort at Pemaquid; and ſo frequent were their aſſaults, and ſo great the public alarm, that the country round retired to Falmouth for ſafety. The ſame month Major Swayn, with ſeven or eight companies from Maſſachuſetts, relieved the garriſon at Blue Point, which was beſet with Indians. Major Church, with another party of Engliſh, and chriſtian Indians, from Plymouth colony, marched to the eaſtward. Swayn making his head quarters at Berwick, ſent Capt. Wiſwel, and Lieut. Flag, on a ſcout. Near Winnipiſioke pond, Flag left a number of his friendly Indians, who continued there a number of days. It was afterwards diſcovered that they had an interview with the hoſtile natives, and gave them all the information in their power. So ſtrong is the attachment that binds us to our native country, that often the bonds of gratitude, oaths and religion, like Sampſon's cords, burſt aſunder, when they interfere with this paſſion. Feeble then is that government which depends on foreigners for defence or counſel.

Garriſons were left in Wells, York, Berwick and Cocheco. October 23d, 1691, Mr Goodridge and his wife were murdered in Rowley, Byfield Pariſh, and the family carried into captivity. The good man was ſhot in his houſe, as he ſtood praying with his family.

Expedition againſt Canada.

As the French were the malignant inſtigators of the Indians in their bloody aſſaults, it was thought eſſential to the peace of New England, that theſe enemies ſhould be attacked in their own dominions. Hence vigorous exertions were made for an expedition againſt Canada. The command was given to Sir William Phips, who ſailed from Hull Auguſt 19th, 1690, with a fleet of 32 ſail, and arrived before Quebec October 5th; but the ſeaſon being far ſpent; the army from Connecticut and New York which was to have entered the province, having returned after viſiting the lake; and the troops with Sir William being ſickly and diſcouraged, the expedition failed, and in November the troops arrived at Boſton. This expedition involved the government in a heavy debt; a thouſand men periſhed, and a general gloom ſpread through the country. In this ſituation, a flag of truce from the ſavages, deſiring a ſuſpenſion of hoſtilities, was doubly welcome. A conference was held at Sagadahoc; they reſtored ten captives, and agreed on a truce till the firſt of May 1691. The next January the ſavages deſtroyed York; killed 50 perſons, and carried 100 into captivity. In 1693, a peace was concluded at Pamaquid.

A new charter obtained.

In 1691 the general court employed two of their members, with Sir Henry Aſhhurſt and the Rev. Dr Mather, to ſolicit the reſtoration of their charter. In this they were diſappointed; but a new charter was given, including the colony of Plymouth, Province of Maine and Nova Scotia, with all the country between Nova Scotia and Maine to the River St Lawrence; alſo Elizabeth Iſlands, Nantucket and Martha's Vineyard, in the government of Maſſachuſetts. But the people were greatly diſappointed in their new charter. Many of their invaluable privileges were taken from them. They no longer choſe their governors, ſecretary, or officers of admiralty. The militia was under the controul of the governor. A houſe of repreſentatives was not mentioned. To levy taxes, grant adminiſtrations, prove wills, and try capital offenders, was the office of the governor and council. But in the true ſpirit of their native independence, the firſt act of the legiſlature in Maſſachuſetts, after receiving the charter, contained the following clauſe: "No aid, tax, tollage, aſſeſſment, cuſtom, loan, benevolence, or impoſition whatſoever ſhall be laid, aſſeſſed, impoſed, or levied on his majeſty's ſubjects, or their eſtates, on any pretence whatever; but by the act and conſent of the governor, council and repreſentatives of the people, aſſembled in general court."

It was now ſeventy-two years ſince the firſt ſettlement of Plymouth. During this period, making their own laws and chooſing their own rulers, New England had eſtabliſhed regulations for promoting learning and religion, not equalled perhaps in any nation. In 1643, there were 36 churches in New England; in 1650, there were 40, which contained 7750 communicants; and though the philoſophiſt points the finger of deriſion at the pious founders of theſe republics, the hiſtory of man does not preſent any people adopting wiſer meaſures, or producing more permanent bleſſings. No where is knowledge more generally diffuſed, no where are morals more correct, religion more pure, or the inhabitants more independent and happy.

Dr Stiles' M. S.

1692. Sir William Phips governor.

The witchcraft infatuation.

Caleſ.

But the faireſt day has its cloud. Sir William Phips the firſt governor under the new charter, found the province in a deplorable ſituation. An Indian war was waſting the frontiers. An agitation, a terror of the public mind in the greater part of Eſſex county, like a tornado, was driving the people to the moſt deſperate conduct. In the tempeſt of paſſion, a government of laws, trial by jury; all the guards againſt oppreſſion, were too feeble to protect the perſon, or property, of the moſt loyal ſubject. The pillars of civil government were ſhaken to their foundation, by the amazing power of ſuppoſed *witchcraft*. In the beginning of 1692, the Rev. Samuel Paris of Salem village, now Danvers, had a daughter aged 9, and a niece aged 11, "who were diſtreſſed with ſingular diſtempers." The means uſed by the phyſician being ineffectual, he gave it as his opinion, that "*they were under an evil hand.*" The neighbours immediately believed that they were bewitched. An Indian ſervant and his wife, privately made ſome experiments "to find out the witch." The children being informed of this, immediately complained of Tituba, the Indian woman, that ſhe pinched, pricked, and tormented them. They ſaid ſhe was viſible to them, here and there, where others could not ſee her. Sometimes they would be dumb, and choaked, and have pins thruſt into their fleſh. Mr Paris, being deeply affected with the diſtreſs of his family, invited a number of his brethren in the miniſtry to viſit him, and give their advice. They adviſed him "to wait on the providence of God, and to be much in prayer." Accordingly two or three private faſts were kept at his houſe, at one of which ſeveral miniſters came and joined with him. After this, there was a public faſt in the village, and afterwards in ſeveral congregations in the neighbourhood; and finally, the general court appointed a faſt through the colony, "to ſeek the Lord, that he would rebuke Satan." Still the diſtreſſes increaſed, more perſons complained of their ſufferings, and more were accuſed. At the ſight of theſe the ſufferers would ſwoon and fall into fits; at the touch of the ſame perſons, they would revive. The public mind was ſhocked and alarmed; the moſt deciſive proceedings followed. For a time, all, or moſt of the people were of one mind. March 2d, there was a public examination at the village, and ſeveral were committed to priſon. There was another examination at Salem, April 22d, and a number more impriſoned. June 2d, an old woman was tried and condemned at Salem, and executed on the 10th, making no confeſſion. Five more were tried June 30th, and executed July 19th; ſix more were tried Aug. 6th, and all executed the 19th, except one woman who pleaded pregnancy. One of theſe was Mr George Burroughs, ſometime miniſter at Wells; he had alſo preached at the village, but met with great oppoſition. A great number of witneſſes appeared at his trial; a ſpecimen of their teſtimonies may be ſeen by the following depoſition. "Elizur Keyſar, aged about forty-five years ſaith, that on Thurſday laſt paſt, being the 5th of this inſtant, month of May, I was at the houſe of Thomas Beadle in Salem, and Capt. Daniel King being there alſo at the ſame time; and in the

ſame

New-England.

ſame room, ſaid Capt. Daniel King aſked me whether I would not go up and ſee Mr Burroughs, and diſcourſe with him, he being then in one of the chambers of ſaid houſe. I told him it did not belong to me, and I was unwilling to make or meddle with it; then ſaid King ſaid, are you not a chriſtian? If you are a chriſtian, go and ſee him, and diſcourſe with him. But I told him I did believe it did not belong to ſuch as I was to diſcourſe him, he being a learned man. The ſaid King ſaid, I believe he is a child of God, a choice child of God, and that God would clear up his innocency. So I told him my opinion or fear was, that he was the chief of all the perſons accuſed for witchcraft, or the ring-leader of them all; and told him alſo, that I believed if he was ſuch a one, his maſter (meaning the devil) had told him before now, what I ſaid of him. And ſaid King ſeeming to me to be in a paſſion, I did afterwards forbear. The ſame afternoon, I having occaſion to be at ſaid Beadle's houſe, in the chamber where Mr George Burroughs kept, I obſerved that the ſaid Burroughs did ſteadfaſtly fix his eyes upon me. The ſame evening, being in my own houſe, in a room without any light, I did ſee very ſtrange things appear in the chimney, I ſuppoſe a dozen of them, which ſeemed to me to be ſomething like jelly that uſed to be in the water, and quivered with a ſtrange motion, and then quickly diſappeared. Soon after which I did ſee a light up in the chimney, about the bigneſs of my hand, ſomething above the bar, which quivered and ſhaked, and ſeemed to have a motion upward; upon which I called the maid, and ſhe looking up the chimney, ſaw the ſame; and my wife looking up, could not ſee any thing. So I did, and do conclude it was ſome diabolical operation"! ! !

Original depoſitions.

On the margin of this depoſition is written, Mr. Elizur Keyſar declared to the jury of inqueſt, that the evidence in the paper is the truth upon oath, Auguſt 31, 1692.

Nine perſons received ſentence of death, September 17th, eight of whom were executed September 22d, one woman being reprieved, pleading pregnancy.—Giles Cory had been preſſed to death, September 16th, becauſe he would not (ſeeing all were convicted) put himſelf on trial by the jury. Previous to this, numbers had confeſſed themſelves guilty of witchcraft, it being the only way of ſaving their lives, none who confeſſed being executed. But the ſuppoſed ſufferers becoming more daring, accuſed ſome of the beſt people in the country. Suſpicion rouſed from its lethargy; condemnation ceaſed; the accuſers were ſilent; thoſe under ſentence were reprieved, and afterwards pardoned.

If we can be convinced by the the uniform proteſtations of thoſe executed, or the confeſſions of numbers who had been accuſers, or the deliberate recantations of others who had confeſſed themſelves witches, or the univerſal conviction of error in the minds of thoſe who had been leading actors in theſe awful ſcenes, or the entire change of public opinion, we ſhall be ſatisfied that the whole originated in folly and deluſion. All theſe are facts. All thoſe executed, the firſt excepted, proteſted their innocence with their dying breath, when a confeſſion would have ſaved their lives. Several years after, perſons who had been accuſers, when admitted to the church confeſſed their deluſion in ſuch conduct, and aſked "pardon for having brought the guilt of innocent blood on the land." The following is an extract from the confeſſion of ſix perſons belonging to Andover, who had owned themſelves witches;—"We were all ſeized as priſoners; knowing ourſelves altogether innocent, we were all exceedingly aſtoniſhed, and amazed, and affrighted out of our reaſon; and our deareſt relations ſeeing us in this dreadful condition, and knowing our great danger, apprehending there was no other way to ſave our lives, perſuaded us to confeſs: we ſaid any thing and every thing which they deſired."

New-England.

Church records of Danvers.

On the day of a public faſt, in the ſouth meeting-houſe of Boſton, one of the judges, who was concerned in the condemnation of theſe unhappy victims at Salem, delivered in a paper, and while it was reading ſtood up: it was to deſire prayers, &c. "being apprehenſive he might have fallen into ſome errors at Salem."

The following is from the declaration of twelve men, who had been jurymen at ſome of theſe trials:—"We do therefore ſignify our deep ſenſe of, and ſorrow for, our errors in acting on ſuch evidence—we pray that we may be conſidered candidly and aright, by the living ſufferers, as being then under the power of a ſtrong and general deluſion." Mr Paris, who was active in the proſecution, and evidently a ſerious and conſcientious man, in his public confeſſion, November 26th, 1694, ſays, "I do acknowledge, upon after conſideration, that were the ſame troubles again to happen, which the Lord of his mercy forever prevent, I ſhould not agree with my former apprehenſions in all points; as for inſtance," &c.

Mr Paris public confeſſion

Martha Cory, a member of the church in Salem village, admitted April 27th, 1690, was, after examination upon ſuſpicion of witchcraft, March 21, 1692, committed to priſon, and condemned to the gallows yeſterday. This day in public, by general conſent, ſhe was voted to be excommunicated out of the church. The following will ſhow, in a moſt affecting manner, the light in which the church viewed this vote, ten years after. "In December, 1702, the paſtor ſpoke to the church on the Sabbath as followeth.—Brethren, I find in your church book a record of Martha Cory's being excommunicated for witchcraft; and the generality of the land being ſenſible of the errors that prevailed in that day, ſome of her friends have moved me ſeveral times to propoſe to this church, whether it be not our duty to recal that ſentence, that ſo it may not ſtand againſt her to all generations. And I myſelf being a ſtranger to her, and being ignorant of what was alleged againſt her, I ſhall now only leave it to your conſideration, and ſhall determine the matter by a vote, the next convenient opportunity.—February 14th, The paſtor moved the church to revoke Martha Cory's excommunication: a majority voted for revoking it." So deep was the people's ſenſe of the errors of thoſe tranſactions, that a great part of Mr Paris's congregation could not perſuade themſelves to ſit under his miniſtry. Accordingly, after great difficulty, after a reſpectable council had laboured in vain for their reconciliation, after an arbitration reſpecting the buſineſs, Mr Paris was diſmiſſed July 24, 1697, as the aggrieved ſtate to the arbitrators, "for being an inſtrument to their miſeries."

Ibid.

If any reader point the finger of ſcorn at the people of Eſſex, or the judiciary of Maſſachuſetts, for their credulity and errors, he is informed they acted in conformity to the public opinion of the world at that time; that they were guided in their judicial proceedings by the writings of Keeble on the common law, Sir Matthew Hale, Glanvil, Bernard, Baxter, &c. He is informed that while the people of this once devoted neighbourhood ſoon ſaw and retracted their errors, and would now be the laſt people to fall into ſuch a deluſion, other parts of the world have been more ſlowly convinced. At Tring, in Hertfordſhire, 20 miles from London, in 1751, two aged perſons were drowned, ſuppoſed to be guilty of witchcraft. At Huntingdon, the anniverſary of the execution of a family for witchcraft is celebrated to this day. A preacher from Cambridge delivers a diſcourſe againſt witchcraft. At Embo, in Scotland, a perſon was executed for witchcraft in 1727. At Rome, the Rev. Father Altizza was lately ſeized for the crime of ſorcery.

Walker's Geog. Magnalia, The Bee.

War kindled by the French.

In 1694, the ſword was drawn again, after being ſheathed about a year. The Sieur Villion, commander of the French at Penobſcot, with 250 Indians from the tribes of St John, Penobſcot, and Norridgwag, aſſaulted the people on Oyſter river, in New-Hampſhire; killed and captured about 100 perſons, and burned 20 houſes, 5 of which were garriſons.

Complaints againſt Governor Phips.

During theſe diſtreſſes, the people became uneaſy, aſcribing their ſufferings to the government, and a number made complaint to the king againſt governor Phips. He and his accuſers were ſummoned to Whitehall. In November he embarked for England. A majority of the general court being in his favour, he carried a recommendation from the legiſlature, that they might not be deprived of ſo excellent a governor. But before his trial, he was ſeized with a malignant fever, of which he died, in the 54th year of his age. Sir William Phips was born of poor parents, on the bank of the Kenneber. He was firſt a ſhepherd, then a ſhip carpenter, then a ſeaman. By diſcovering a Spaniſh wreck, near Port De La Plata, he became rich, and was brought into notice. He was a man of enterprize, diligence, and perſeverance, religious himſelf, and diſpoſed to promote piety in others.

His death.

Mather.

Indian ravages.

The Indians continuing to ravage the frontiers, in October, 1695, a party penetrated to Newbury, and made captives of John Brown and his family, excepting one girl who eſcaped, and ran 5 miles to the water ſide, near Newburyport, and alarmed the people.—Capt. Greenleaf inſtantly purſued, and, before it was light the next day, overtook and reſcued the captives, nine in number. The Indians, when they found it impoſſible to carry them off, had determined and attempted to kill them; but ſuch was their hurry, the wounds they gave them were not mortal: all recovered.

The French and Indians, in 1696, took and demoliſhed the fort at Pemaquid.

Projected French invaſion fails, and iſſues in peace with the Indians.

In 1697, the French projected an invaſion of the country. A fleet arrived at Newfoundland, expecting an army from Canada, to aſſault Boſton, and ravage the coaſt to Piſcataqua; but the ſeaſon was advanced, proviſions failed, and the deſign was relinquiſhed. After the peace of Ryſwick, 1698, the French could no longer aſſiſt the ſavages; they therefore buried the hatchet, reſtored their captives, ratified their former engagements, and, in 1699, ſubmitted to the Britiſh crown.

Earl Bellamont governor.

At the cloſe of the war in Europe, the king appointed the earl of Bellamont governor of New-York, Maſſachuſetts, and New-Hampſhire. He reſided at New-York; Mr Stoughton conducted the affairs of New-England. In May, lord Bellamont viſited Boſton. He was a nobleman of polite, conciliating manners, and profeſſed great eſteem for the congregational miniſters, and with the general court, as was cuſtomary at that time, attended the ſtated Thurſday lectures at Boſton. In his time, the pirates, who had been connived at for 30 or 40 years, were arreſted and puniſhed. Numbers were executed at Boſton; Bradiſh, Kidd, and others were carried to England, tried and executed.

Pirates executed.

Soon after the ſeſſion of the general court, in May, 1700, lord Bellamont returned to New-York, where he died, the 5th of March following.

Dudley governor.

Queen Ann appointed Joſeph Dudley, Eſq. to ſucceed him as governor of Maſſachuſetts and New-Hampſhire, in 1702. According to his inſtructions, he required a permanent ſalary, and maintained a long and obſtinate ſtruggle with the general court of Maſſachuſetts, but was finally obliged to relinquiſh the object.

War with the French and Indians.

In 1703, the Indians, aided as uſual by the French, attacked all the ſettlements from Canſo to Wells; killed and took about 130 people, and burned many houſes. Women and children fled to garriſons; the men carried their arms into the field of labour, and poſted centinels round them; ſmall parties of the enemy were frequently making aſſaults; and the whole country, from Deerfield to Canſo, for ſome time was in conſtant alarm. Towards the cloſe of the year, 300 French and Indians fell upon Deerfield, murdered 40 of the inhabitants, took 100 captives, and left the village in flames. To repel ſuch bloody foes, the famous Col. Church, ſo diſtinguiſhed in the wars of Philip, in 1704, was ordered to the eaſtward. At Piſcataqua, he was joined by major Hilton; they deſtroyed Minas and Chignecto, and did ſome damage to the French at Penobſcot and Paſſamaquoddy.

The following year, a number of captives taken at Deerfield were redeemed. In April, 1706, the Indians killed 8 people at Oyſter-river. The garriſon was near, but not a man in it. The women put on hats, looſened their hair, and fired ſo briſkly, that the enemy fled, without burning or plundering the houſe they had aſſaulted. The year following, the Indians came to Reading, within 10 miles of Boſton, killed a woman and three children, and carried off 5 captives. Perſons were alſo killed and priſoners taken this year at Chelmsford, Sudbury, Groton, and Exeter.

Belknap.

Death of governor Winthrop.

On the 27th November, 1707, died John Winthrop, Eſq. governor of Connecticut, and was buried in Boſton. The bones of John Winthrop, the firſt governor of Maſſachuſetts, his ſon and grandſon, governors of Connecticut, reſt in the ſame tomb, in the oldeſt burying ground in Boſton. There was this year an unſucceſsful expedition againſt Port Royal.

Hutchinſon.

On the 29th of Auguſt, 1708, Haverhill was aſſaulted by the Indians; 30 or 40 perſons were killed, among whom was their miniſter, Mr Rolfe; 20 or 30 houſes were burned, and the reſt plundered. Such had been the loſs of men in Maſſachuſetts, by their dreadful wars with the French and Indians, that, in 1713,

New-England.

Effects of French and Indian wars. Hutchinſon.

1713, the province had not doubled in half a century. The ſame obſervations may be made reſpecting the period from 1722 to 1762. Had the French in Canada been ſubdued a hundred years ſooner, it is ſuppoſed there would have been more than three hundred thouſand ſouls in New-England, more than there now is.

Acadia taken, and annexed to New-England.

In 1710, the territory of Acadia was ſubdued, by the ſurrender of Port Royal. The name of the place was changed to Annapolis, in honour of the queen. Samuel Vetch, a colonel in the victorious army, was appointed governor.

Unſucceſsful expedition againſt Canada.

Trumbull.

State of New-England churches.

This ſucceſs encouraged New England to attempt, the next year, the conqueſt of Canada. General Nicholſon was ſucceſsful in ſoliciting aid from the Britiſh court. The combined army of Old and New-England troops, being 6,500 men, with a fleet of 5 ſhips of war, engaged in the enterprize; but in the way, eight tranſports were wrecked on Egg-Iſland, and a thouſand people periſhed, among whom there was but one man from New-England. The expedition was relinquiſhed: the conſequence was new aſſaults from the ſavages. But news of the peace of Utrecht arriving, a ſuſpenſion of arms was proclaimed at Portſmouth, October 29, 1712. The Indians came in, and agreed upon articles of peace. Never was an event more welcome to the provinces. They had been bleeding for almoſt 40 years; five or ſix thouſand men had fallen in battle, or by diſeaſe, in the army. Maſſachuſetts and New-Hampſhire were the principal ſufferers. The inhabitants of Connecticut had increaſed to about ſeventeen thouſand. The people were religious; their righteouſneſs exalted their character. In 1696, there were one hundred and thirty churches in theſe colonies, thirty-five of which were in Connecticut. At this period, Connecticut had forty-five towns. The number of ordained miniſters was forty-three. There was an ordained miniſter to every four hundred perſons, or to every eighty families. There was not one vacant church in the colony. There was alſo a number of candidates preaching in the new towns, where no churches were formed. About this time Boſton was laid in aſhes by an accidental fire, but was ſoon rebuilt in a more elegant ſtyle.

Shute governor;

The death of queen Ann, and the acceſſion of George I. was announced in New-England, September 15, 1714. Col. Shute being appointed governor of Maſſachuſetts and New-Hampſhire, Mr Dudley retired to a private ſtation. He was a man of ambition, poſſeſſing too high ideas of royal authority, to accord with the republican feelings of the people of New-England. Their controveſies with him, and with other governors, proved, that they could never be enſlaved, till their character was totally changed. Col. Shute arrived in Boſton, October 5th, 1716, and was received with great parade. The ſummer following, he, with a number of the council from both provinces, met the Indians at Arrocoſic Iſland, to confirm their friendſhip, to perſuade them to relinquiſh popery, and embrace the proteſtant religion. He offered them an Indian bible, and a proteſtant miſſionary; they rejected both.

His controverſy with the legiſlature.

Some time elapſed before the oppoſition uſually diſplayed againſt royal governors ſhowed itſelf; but, in 1720, the ſtorm roſe higher than it had for a number of years. The governor negatived the ſpeaker, choſen by the houſe; they refuſed to chooſe another; he diſſolved them. The flame of popular reſentment blazed through the province. He revived the old controverſy of a fixed ſalary, and met with the fate of his predeceſſors. But the people of New-Hampſhire were ſatiſfied with governor Shute's adminiſtration, and contributed more than their proportion towards his ſupport. So ſtrong was the tide of oppoſition at Boſton, that the governor, in 1720, returned to England, and preſented a variety of complaints againſt the houſe of repreſentatives. Among other things, he complained, that they had uſurped his right of appointing days of faſting and thankſgiving. The Britiſh miniſtry juſtified the governor, and the province was obliged to accept an explanatory charter, dated Auguſt 12th, 1724. This confirmed the right of the governor to negative the ſpeaker, and forbid the houſe to adjourn for more than two days, without his conſent.

Small pox firſt inoculation in America.

In 1721 the ſmall pox was very mortal in Boſton, and ſeveral adjacent towns. In Boſton 5889 caught it, and 844 died. The Rev. Dr Cotton Mather had read of inoculation among the Turks. He recommended it to the phyſicians. Dr Boylſton alone complied. He was firſt ſucceſsful in his own family, and afterwards gave it to many others in the ſame way; but the buſineſs was, in general, very unpopular, and finally forbidden by the general court.

Indian war.

In the winter an unſucceſsful attempt was made to ſeize Ralle, the French miſſionary at Norridgwag. This provoked the Indians to vengeance, and after various hoſtilities, they deſtroyed Brunſwick. By theſe things the government was induced in 1722, to make another attempt upon Norridgwag. Captains Moulton and Harman of York, ſurpriſed the village, killed the Jeſuit and about 80 Indians; reſcued three priſoners, burned the wigwams, and chapel; and brought away the plate and furniture. The military ſpirit was rouſed, government offered £100 for every ſcalp; captain Lovewell of Dunſtable became a daring adventurer. At one time he brought in ten ſcalps; but ſoon after fell in battle with more than a fourth part of his companions, near Winipiſiokeepond.

Hutchinſon.

After governor Shute's departure, lieutenant governor Dummer managed the affairs of Maſſachuſetts, and Mr Wentworth thoſe of New Hampſhire. In 1724 fort Dummer was built in Hinſdale and the firſt ſettlement made in Vermont. (*See* Vermont.) At his deceaſe, governor Dummer bequeathed a valuable eſtate in Byfield to that pariſh, towards ſupporting a grammar ſchool. This is now Dummer Academy.

Burnet governor.

His death.

Upon the acceſſion of George II. in 1727, Mr William Burnet, ſon to the good biſhop of Sarume, was appointed governor of Maſſachuſetts and New Hampſhire. He had been popular as a governor of New York and New Jerſey, and was received in Boſton with great pomp, being met there by the lieutenant governor of New Hampſhire, and a committee of the council and aſſembly. The government of New Hampſhire gave him a fixed ſalary on certain conditions, but in Maſſachuſetts there was ſoon a warm altercation between him and the general court on this ſubject. His nerves ſhould have been "made of ſterner ſtuff," to contend with Maſſachuſetts. He was diſappointed; he was depreſſed; he died in a few months. When the news of this reached England, the reſentment there was ſo great, that a propoſal was made of reducing the colony to abſolute dependence on the crown; but milder meaſures prevailed, and Mr Jonathan Belcher, a native of the province, an only ſon of a wealthy farmer, then a merchant in London, was appointed governor of Maſſachuſetts and New Hampſhire.

Belcher governor.

While theſe provinces were in a conſtant ferment by their contentions with their governors, Connecticut and Rhode Iſland, under their ancient charter, enjoyed tranquillity, choſe their own rulers, and enacted their own laws. The altercations of Maſſachuſetts fanned the coals of independence, and finally produced the exploſion which has forever ſeparated the two countries.

In Auguſt 1730, Mr Belcher was received with great joy; like his predeceſſors he propoſed a fixed ſalary, like them he ſaw his propoſal repelled with violence. He ſaw the cauſe was deſperate, and obtained leave from the Britiſh court, to receive ſuch ſums as ſhould be granted him. So terminated the long, the tedious conteſt reſpecting the governor's ſalary.

The diviſional line in 1740, was finally determined by the lords of the council, between New Hampſhire and Maſſachuſetts. New Hampſhire obtained 14 miles in breadth, and about 50 in length, more than they had claimed. A party the following year oppoſed Mr Belcher, and by their inceſſant applications to the miniſtry, by falſehood and forgery, they finally prevailed. He was ſucceeded in New Hampſhire, by Benning Wentworth; in Maſſachuſetts by William Shirley. Mr Belcher repaired to court; demonſtrated his own integrity and the baſeneſs of his enemies, was appointed governor of New Jerſey, paſſed a quiet life, and his memory has been treated with merited reſpect.

Belknap.

Shirley governor.

Capture of Louiſbourg.

In 1744, news of war with France and Spain being received, forces were raiſed to attack Nova Scotia. Governor Shirley projected an invaſion of Louiſbourg, the *Dunkirk of America*. Its fortifications had employed French troops twenty-five years, and coſt 30,000,000 livres. A majority of one, in the general court voted for the expedition. The land forces were commanded by colonel William Pepperell of Kittery; the Engliſh ſquadron by commodore Warren. The laſt of April, the following year, the troops, 3800 in number, landed at Chapeaurogue Bay. The tranſports had been diſcovered early in the morning from the town, which was the firſt notice they had of the deſign. In the night of May 2, 400 men burned the ware-houſes containing the naval ſtores. The French were alarmed, ſpiked their guns, flung their powder into a well, and abandoning the fort, fled to the city. The New England troops cheerfully ſubmitted to extreme hardſhips; for 14 nights ſucceſſively, they were yoked together like oxen, dragging cannon and mortars, through a moraſs of two miles. The commanding artillery of the enemy forbade this toil in the day. No people on earth perhaps, are more capable of ſuch laborious and daring exploits, than the independent farmers of New England. On the 17th of June, the garriſon capitulated, but the flag of France was kept flying, which decoyed into the harbour, ſhips of the enemy, to the value of £600,000 ſterling. The weather, during the ſiege, was fine, but the day following rains began, which continued 10 days, and muſt have proved fatal to the provincial troops, had not the capitulation prevented. The good people of New England were deeply affected by this evident interpoſition of divine providence.

Threatened invaſion of New-England by the French.

The next year, 1746, a French fleet ſailed to pour deſtruction on New England. Twenty men of war, an hundred tranſports, eight thouſand veteran troops, made the country tremble. In their conſternation they were diſappointed of a ſquadron of defence, from the mother country. God interpoſed. A mortal ſickneſs ſpread through the fleet; a tempeſt ſcattered them; the commander, diſappointed and mortified, poiſoned himſelf, his ſucceſſor fell on his ſword. Never was the hand of divine providence more viſible; never was a diſappointment more ſevere to the enemy; never a deliverance more complete without human aid, than this in favour of New England.

Belknap.

As the diſtreſſes of war ceaſed, the people were alarmed in 1749, with the report of an American epiſcopacy; but the deſign was not executed. This year, Benning Wentworth made a grant of Bennington.

A congreſs convene at Albany.

In 1754 a congreſs met in Albany, conſiſting of delegates from New Hampſhire, Maſſachuſetts, Rhode Iſland, Connecticut, New York, Pennſylvania, and Maryland; but the plan of government they propoſed was rejected, both in England and America. Had this inſtrument been accepted the mind is loſt in conjecturing what might have been the conſequences. Perhaps the revolution of 1776, had been poſtponed a long period; perhaps the millions and millions of the human race lately deſtroyed in Europe, and Aſia, by the demon of revolutionary madneſs, might have long ſurvived, to ſwell the tide of human felicity.

Nova Scotia taken from the French.

Preparations were made, in 1755, to diſlodge the French from Nova Scotia. Colonel Winſlow raiſed two thouſand men, but the command of the expedition was given to colonel Monkton. The French were ſubdued. The inhabitants had taken the oath of allegiance to the Britiſh crown, but were accuſed of furniſhing ſupport and intelligence to Indians and French in annoying the colonies, ſome of them were in arms. It was determined to remove them; about two thouſand ſouls were accordingly tranſported to New England. The cloud of their ſorrows was never diſpelled; in a land of ſtrangers they pined away and died. They were remarkable for the ſimplicity of their manners, the ardor of their piety, and the purity of their morals.

Braddock's defeat.

General Braddock, with 2200 regular and provincial troops, marched this year for fort du Queſne, but fell into an ambuſcade, and was fatally wounded, panic ſeized his regular troops, but colonel Waſhington, his aid-de-camp, with his militia, covered their retreat, and ſaved the ſhattered army.

Succeſs of the Engliſh arms.

In 1758, Louiſbourgh, Frontenac, and Fort du Queſne, ſubmitted to the Engliſh, a ſmall compenſation for more than 2000 men killed and wounded in the raſh and unſucceſsful attack upon Ticonderoga. Splendid were the victories of the year 1759. Niagara, Ticonderoga, Crown Point, and Quebec, ſubmitted to the Engliſh. At the taking of Quebec, Wolfe, the Britiſh commander, after being wounded in the wriſt, received a fatal ball in his breaſt. Leaning on the ſhoulder of a lieutenant; ſinking in the agonies of death, he heard a cry "they run." For a moment reviving, he aſked who ran. It was anſwered "the French." He replied "I thank God I die happy," and expired. Montcalm, the French commander, alſo the ſecond in command,

Humphreys.

was killed. Quebec ſurrendered, and the whole province was ſoon annexed to the Britiſh empire.

In 1762, Martinico, Grenada, St Vincents, and Havanna ſubmitted: Engliſh valour was triumphant in every quarter of the globe; peace followed.

Commencement of the American Revolution.

Stamp act.

It was now thought a proper time to tax America. The ſtamp act which paſſed in 1765, rouſed New England. Every mean was uſed to inform the mind, and kindle the paſſions. Maſſachuſetts made the propoſal, and a congreſs aſſembled. In Connecticut the people met; the ſtamp maſter reſigned. The firſt of November, when the ſtamp act was to operate in Boſton, the bells tolled, ſhops were ſhut, effigies of the royaliſts were carried about in deriſion, and torn to pieces. There was no violence to any perſon, no diſorder. At Portſmouth the bells tolled; a coffin was prepared; on the lid was inſcribed, "Liberty, aged 145;" a proceſſion moved with unbraced drums; minute guns were fired; an oration was delivered at the grave. At the cloſe, the coffin was taken up, ſigns of life appeared in the corpſe; "Liberty revived," was ſubſtituted; the bells ſtruck a cheerful key; joy ſparkled in every countenance. All was decency and order. At Rhode Iſland the day paſſed in a ſimilar manner. In March 1766, the obnoxious act was repealed; ſhips in the Thames diſplayed their colours; houſes were illuminated through the city of London; the colonies rejoiced in their deliverance.

The limits of this article, prevent a detail of the various events, which produced the revolutionary war, and the independence of the United States. We only obſerve that new duties on various articles, the ſending of troops to Boſton; the firing of the guard, after they had been highly provoked, which was called a maſſacre; the ſhutting up of the port of Boſton, &c. again fired the indignation of the country. Votes of legiſlatures, committees of correſpondence, liberty poles in towns and villages, diſplayed the reſolute zeal of the people to defend their rights.

War commenced.

Battle at Lexington.

An army raiſed.

In the night of April 18th, 1775, Gen. Gage ſent 800 troops to deſtroy the ſtores at Concord. At eleven o'clock they embarked at Boſton common, and landed at Phip's farm with all poſſible ſtillneſs. But ſo watchful were the people; ſo alive to every motion of the Britiſh troops, that nothing could be obtained by ſtratagem. News was inſtantly carried to Concord, and the country was alarmed. By two in the morning, 130 of the Lexington militia had aſſembled to oppoſe them. Between 4 and 5 o'clock, the enemy appeared. Major Pitcairn, rode up, ordered the militia to diſperſe, fired his piſtol and ordered his men to fire. Some were killed, ſeveral returned the fire; but the Britiſh proceeded to Concord, and executed their commiſſion. There they fired upon major Butterick; he returned the fire, and the Britiſh ſoon began their retreat to Boſton. The Americans cloſely followed, firing from fences and walls. At Lexington, Lord Percy met them with 900 men. Theſe having two pieces of cannon, kept their purſuers a greater diſtance. Before dark they reached Bunker-Hill, having travelled that day between 30 and 40 miles. The next day they returned to Boſton. Sixty-five of their number had been killed, 180 wounded, 28 taken priſoners. The Americans had 50 killed, 38 wounded, and miſſing. The provincial congreſs then ſitting, voted an army of 30,000 men; 13,600 to be from their own province. They ſent to the other New England colonies, an army of 20,000 men inſtantly inveſted Boſton, under the command of general Ward. Soon were theſe joined by a large body from Connecticut, under General Putnam, whoſe name was then a hoſt. The continental congreſs reſolved then to organize an army, and recommend a general faſt. The clergy, in their ſermons and prayers conſecrated the cauſe, and kept alive the ardour of the people. Colonel Arnold ſent from Connecticut, being joined by colonel Allen, May 10th, took Ticonderoga, and Crown Point, with all their military ſtores.

Bunker hill battle.

On the night of June 16, 1775, general Putnam with a thouſand men, took poſſeſſion of Breed's Hill (erroneouſly called Bunker's.) They laboured with ſuch diligence and ardour, that by the dawn of light, they had thrown up a redoubt, of 8 rods ſquare. As ſoon as the Britiſh ſhips diſcovered them in the morning they began a heavy fire, which was ſupported by a fort on Cop's hill in Boſton. An inceſſant ſtorm of balls and bombs, was poured on this handful of farmers, the greater part of whom had probably never heard the roar of artillery before. Diligently they continued their work, and had almoſt completed a breaſtwork to the water eaſtward; when the firing became intolerable. They had been laborious through the night; they had not been relieved, nor ſupplied with refreſhment. In this exhauſted ſituation, they were deſtined to meet the fury of Britiſh valor. A little after noon boats and barges filled with 3,000 veterans, the flower of the royal army, landed in Charleſtown. Generals Howe, and Pigot, commanded. Bourgoyne and Clinton ſtood watchful on Cop's hill. Britiſh troops and citizens of Boſton, crowded their roofs and ſteeples to witneſs the dubious conflict. The American army and the country people, thronged the ſurrounding hills. The fleet, as well as the camps gazed at the opening ſcene. The king's troops deliberately advanced, that their artillery might demoliſh the new raiſed works. Charleſtown was now ſet on fire, by order of the Britiſh commander, and immediately 400 houſes were in a blaze. The lofty ſteeple of the meeting houſe, formed a pyramid of flame, magnificent and awful, in view of many thouſand anxious ſpectators. The ſlow approach of the enemy, gave time to aſſume greater preſence of mind. In this criſis Putnam made an harangue. He reminded them "that they were all markſmen; and could bring a ſquirrel from the higheſt tree." He charged them "to be cool and reſerve their fire till the enemy were near; till they could ſee the white of their eyes." They obeyed. At the diſtance of ten rods, they began a furious diſcharge of ſmall arms. The Britiſh, whoſe ranks were thinned, retreated with precipitation. Again Putnam addreſſed his men. He told them "they had done well, and would do much better, and directed them to aim at the officers." The Britiſh returned. The fire was terrible. Their officers exclaimed, "it is downright butchery to lead the men againſt the lines." In telling the ſtory, "My God," ſaid Putnam, "I never ſaw ſuch carnage of the human race." At the next aſſault, the enemy receiving new ſtrength by the arrival of general Clinton; the cannonade from the ſhips, the batteries of Boſton, and the field artillery increaſing its fury, and the powder of the Americans failing, a retreat was ordered. Fifteen hundred Americans were engaged; ſeventy-ſeven were killed, among whom was the brave general

See note in Rev. Mr Pariſh's ſermon on the death of general Waſhington.

Warren, a volunteer in the action ; 278 were wounded and miſſing. The Britiſh loſt one thouſand and fifty-four killed; of whom 19 were commiſſioned officers.— A greater number than they loſt at the battle of Quebec, which gave them the province of Canada; a proof that Putnam's orders were not diſregarded.

Falmouth burnt.

Expedition to Canada.

The people of Falmouth, now Portland, violently oppoſing the loading of a maſt ſhip, captain Mowat received orders to burn the town. Privateers at this time were ſucceſsful. Captain Manley brought in a veſſel loaded with military ſtores, valued at £50,000. This ſummer a detachment was ſent from Cambridge to Quebec, under the command of colonel Arnold ; they aſcended the Kennebec, and had a diſmal march thence into Canada. Many of the men became ſickly ; one third were diſcouraged and returned; thoſe who bravely perſevered were compelled to eat their dogs, their ſhoes, and even their cartouch boxes. In thirty one days they again found inhabitants. They joined general Montgomery, and with him ſcaled the walls of Quebec. American valor was unſucceſsful. The brave Montgomery fell; Arnold was wounded ; one hundred men were killed or wounded, three hundred taken priſoners. Theſe general Carlton treated with the moſt delicate humanity, as he always did his priſoners.

Boſton evacuated.

On the night of March 4th, 1776, works were raiſed on the hills of Dorcheſter, twelve hundred men were employed, and two hundred teams. So prodigious were their labours that in the morning, the whole ſeemed to the Britiſh " like enchantment and inviſible agency." General Howe was ſeized with conſternation. In vaſt confuſion and hurry Boſton was evacuated.

Of affairs in the north.

In 1777, aſtoniſhment and terror ſpread through New England by the flight of St Clair from Ticonderoga. The rear of his army was attacked at Hubberton, a few miles from Lake George. The brave col. Francis of Beverly fell, with a number of his men. General St Clair was at Caſtleton within hearing of the muſquetry, but though his officers entreated with tears, that they might return to ſuccour their brethren, he forbade them. General Stark turned the alarming tide of affairs by his gallant action at Bennington. He routed colonel Baum, and killed or wounded a great part of his detachment. This kindled new courage through the Eaſtern States. It was the firſt ſtep to the capture of Bourgoyne, which procured us ſuccour in Europe, and inſured the independence of the country. This year Vermont declared itſelf a ſovereign ſtate.

Sullivan's unſucceſsful expedition againſt Rhode-Iſland.

Five hundred Britiſh and Heſſian troops burned the meeting houſe in Warren (Rhode-Iſland,) the church in Briſtol, and a number of houſes in each town in 1778. Newport was ſoon threatened by land and ſea. General Sullivan paſſed to the iſland with ten thouſand troops in high ſpirits, and nothing forbid the conqueſt of the Britiſh, who took poſſeſſion of this iſland in 1776, but a failure of aid from the French fleet. This brought on them many execrations in New England. General Pigot, the Britiſh commander, had ſo placed himſelf, that a fleet was neceſſary to attack them with hope of ſucceſs. After an action, ſupported with ſpirit, Sullivan left the iſland with the loſs of 2 or 300 men.

Tryon's expedition into Connecticut.

In the ſummer of 1779, governor Tryon landed at New-Haven and plundered the town, proceeding by water burned Fairfield ; continuing the work of deſtruction he burned part of Greens Farms, and the pleaſant town of Norwalk.

American Academy incorporated.

On the 4th of May 1780, the American Academy of Arts and Sciences, now one of the moſt reſpectable literary ſocieties in America, was incorporated by the general court of Maſſachuſetts.

New London burnt.

Early in the morning of September 6th, 1781, general Arnold landed a detachment of troops on Groton Point, and proceeded up to New London with his fleet. He ſet fire to the town, and immediately 60 houſes and 84 ſtores were deſtroyed, without oppoſition. But the party at Groton found more bloody work. The men in Fort Griſwold, who had haſtened there in the morning, from the neighbourhood, defended themſelves to the laſt extremity. The Britiſh finally entered the fort, ſword in hand, and killed every man they found. Col. Ledyard reſigning his ſword, the officer plunged it into his heart. One man eſcaped by concealing himſelf in the magazine, another by climbing up a chimney in the barrack; one or two, who fell wounded among the ſlain ; recovered. Awful was this day to Groton. The compact part of the town was in aſhes; ſeventy of her valuable citizens, who in the morning ruſhed to arms, lay dead in the fort ; they were conveyed to their families for interment. Peace between the belligerent powers, put an end to theſe bloody ſcenes in 1783.

In 1784, New Hampſhire eſtabliſhed a conſtitution of civil government, as Maſſachuſetts had done in 1780. Connecticut, and Rhode Iſland, continued their ancient conſtitutions, and experienced no ſenſible change by the revolution.

Inſurrection in Maſſachuſetts.

Owing to their embarraſſed circumſtances, from the decay of trade, the loſs of public credit, the weight of public and private debts, in the fall of 1786, the three eaſtern counties of Maſſachuſetts obſtructed the judicial courts ; but were ſoon brought to ſubmiſſion, and are now very generally among the zealous friends of good government.

Federal conſtitution.

The next year the federal conſtitution was formed, and afterwards adopted by all the ſtates of New England ; who with the other parts of the union, have liberally ſhared the bleſſings of that event, in the revival of commerce, and public credit, the increaſe of wealth, the promotion of the liberal arts, and all that exalts or adorns civil ſociety; long may theſe enterpriſing States remain ſolid pillars in the federal edifice ; and long maintain the pure morals, the ſerious religion and wiſe inſtitutions of their pious forefathers.

New-England is a country which preſents to the traveller all the varieties of ſurface which can be found. There is a plain of great extent in the ſoutheaſtern part of Maſſachuſetts. Extenſive plains are alſo ſpread through a conſiderable part of the counties of York and Cumberland, and along the Merrimack through the interior of New Hampſhire. Many others not inconſiderable exiſt in other places. Vallies of every ſize, from the great Connecticut valley to the little baſon, conſtitute of courſe no inconſiderable part of a country which is ſo generally undulating, and whoſe hills are a proverbial deſcription of its ſurface. Connecticut valley extends from Saybrook to the Canada line, and is not far from three hundred miles in length. Its breadth varies from half a mile to twenty miles, and is charmingly diverſified by the intruſion of numerous ſpurs from the two great ranges of mountains which form its eaſtern and weſtern boundaries.

The mountains in New-England are either long ranges or ſeparate eminences. The weſternmoſt range begins in the county of Fairfield, and, paſſing through the counties of Litchfield and Berkſhire, may be ſaid to unite with the Green Mountains at Williamſtown, in the northweſt corner of Maſſachuſetts: being there ſeparated only by the narrow valley of Hooſac river. The higheſt part of this range is Toghkonnuck mountain in Egremont, the ſouthweſtern corner of the ſame ſtate. Over this mountain, which is probably elevated more than 3000 feet above the ocean, runs the boundary between Maſſachuſetts, Connecticut, and New York. This range, hitherto known by no appropriate name, may with propriety be called *Toghkonnuck Range*.

The ſecond range is that of the *Green Mountains*. The eaſtern front of this range begins at New Haven, in a noble bluff called Weſt Rock, and extends thence, to the Canada line; ſloping however with a very gradual declenſion, in the northern parts of Vermont; and in Canada becoming merely a collection of ſmall hills. The two higheſt ſummits of this range are the Camel's Rump, (ſo called from its ſtrong reſemblance to the back of that animal) and the mountain of Manſfield, both in Vermont, in the county of Chittenden: Theſe are very lofty, ſeveral thouſand feet above the ocean. The third range begins alſo at New Haven in another very delightful eminence, called the Eaſt-Rock; and, paſſing through the counties of New Haven, Hartford, and Hampſhire, extends into Canada, through the whole length of the ſtate of New Hampſhire. The Blue Hills in Southington, Mount Tom, Mount Holyoke, in the vicinity of Northampton and Hadley, and Mount Toby, in Sunderland, are the principal ſummits of this range ſouth of New Hampſhire. This range although leſs lofty than the higheſt parts of the two former, is yet more precipitous and romantic than either. It croſſes Connecticut river juſt below Northampton and Hadley in Maſſachuſetts. No mountains in New England preſent, from their ſummits, ſo delightful views as are furniſhed by various eminences of this range. This may be advantageouſly termed *The range of Mount Tom*, which is the principal eminence.

The ſouth or eaſtern range is leſs diſtinctly marked; it begins at Lyme, in Connecticut, and forms the eaſtern boundary of the Connecticut valley, until it unites with the laſt mentioned range in the county of Hampſhire. It has no very remarkable eminences.

Of ſingle mountains, the higheſt, in Maſſachuſetts, is Saddle mountain, in the towns of Adams and Williamſtown, ſo called from its ſtriking reſemblance to that piece of furniture. This mountain is computed to be little leſs than 4000 feet above the ſurface of the ocean. Its ſouthern point is the higheſt land in Maſſachuſetts. Watchuſett is a lofty hill in Princeton, in the county of Worceſter. Aſchutney is a noble ſingle hill in Windſor, in the ſtate of Vermont. Monadnock is a very lofty conical mountain in Jaffrey, New Hampſhire. The White Mountains in New Hampſhire are a round clump with numerous ſummits, of which *Mount Waſhington*, is far the higheſt; being probably between ten and eleven thouſand feet above the ſurface of the ocean; and much the higheſt land in the United States. Nothing can be more majeſtic than the appearance of this mountain; it is covered a great part of the year, with ſnow, and in this ſtate is ſeen ninety miles at ſea, in fair weather, and one hundred and ſixty from its baſe. The mountains called Mooſehillock, or Mooſhecock and Oſſipee, are ſhort ranges in New Hampſhire, of very conſiderable height, and very reſpectable appearance; as are thoſe called Pondicherry, (vulgarly Cherry) a lofty range of the White Mountains, on the northweſt; though theſe laſt may be conſidered as a continuation of the range of Mount Tom.

New England abounds in cataracts and caſcades, alternately of great beauty and grandeur; of the firſt of theſe, the Connecticut, Houſatonic, or Hooeſtonnuc, Onion, Saco, Kennebec, and Penobſcot furniſh a great number, as do alſo ſeveral ſmaller rivers. The caſcades of the White Mountains are perhaps unrivalled in their romantic beauty.

Precipices of great wildneſs and grandeur, are preſented by very many of theſe mountains. The ſouthweſtern ſide of the ſummit of Mount Waſhington, particularly, which is a perpendicular deſcent of vaſt extent, and is ſuperlatively majeſtic and awful. Of ſofter or more elegant ſcenery, few countries furniſh ſo many or ſo exquiſite varieties as New England. The fine intervals which border its numerous ſtreams, particularly the noble ones on the Connecticut, are among the moſt finiſhed beauties of the landſcape. To complete the picture, the native and univerſal verdure which clothes the lean and dry, as well as the rich and moiſt part, gives an unrivalled cheerfulneſs to the whole country.

New England has a very healthful climate, as is evinced by the longevity of the inhabitants. It is eſtimated that about one in ſeven of the inhabitants live to the age of 70 years; and about one in thirteen or fourteen to 80 years and upwards.

North-weſt, weſt, and ſouth-weſt winds are the moſt prevalent. Eaſt and north-eaſt winds, which are unelaſtic and diſagreeable, are frequent at certain ſeaſons of the year particularly in April and May, on the ſea-coaſts. The weather is leſs variable than in the middle and eſpecially the ſouthern ſtates, and more ſo than in Canada. The extremes of heat and cold, according to Farenheit's thermometer are from 20° below to 100° above 0. The medium is from 48° to 50°. The inhabitants of New England, on account of the dryneſs of their atmoſphere, can endure without inconvenience, a greater degree of heat than the inhabitants of a moiſter climate. It is ſuppoſed by ſome philoſophers, that the difference of moiſture in the atmoſphere in Pennſylvania and New England is ſuch as that a perſon might bear at leaſt ten degrees of heat more in the latter than in the former.

The quantity of water which annually falls in England is computed at 24 inches; in New-England, from 42 to 48; and yet in the latter they ſuffer more from drought than in the former. Theſe facts evince the remarkable dryneſs of the atmoſphere, in this eaſtern diviſion of the United States, and in part account for its ſingular healthfulneſs. Winter commonly commences, in its ſeverity, about the middle of December; ſometimes earlier, and ſometimes not till Chriſtmas. Cattle are fed or houſed, in the northern parts of New-England, from about the 20th of November to the 20th of May; in the ſouthern parts not quite ſo long. There have been froſts in every month in the year, though not in the ſame year; but not very injurious.

The diſeaſes moſt prevalent in New-England are the following, viz.

Alvine fluxes
St. Anthony's Fire
Aſthma
Atrophy
Catarrh
Colic
Inflammatory } Fevers.
Slow nervous, and } Fevers.
Mixed } Fevers.
Pulmonary Conſumption
Quinſy
Rheumatiſm.

Of theſe diſorders, the pulmonary conſumption is much the moſt deſtructive, and is commonly the effect of imprudent expoſures to cold and rainy weather, and the night air with the ſame quantity of clothing, and the wearing of damp linen; and among the loweſt order of people, from the intemperate uſe of ſtrong liquors, eſpecially of freſh diſtilled rum, which, in too many inſtances, proves the bane of morals, and the ruin of families.

The ſmall pox, which is a ſpecific, infectious diſeaſe, is not allowed at preſent to be communicated by inoculation, except in hoſpitals erected for the purpoſe, in bye places, and in caſes where there is a probability of a general ſpread of the infection in a town. Nor is this diſeaſe permitted to be communicated generally by inoculation, in any of the United States, except New-York, New-Jerſey, Pennſylvania, Delaware and South Carolina.

In populous towns, the prevalent diſeaſes are more numerous and complicated, owing to want of freſh air and exerciſe, and to luxurious and faſhionable living.

In theſe northern latitudes, the prevalent diſorders among the males of the winter months are *inflammatory*. Both men and women ſuffer from not adopting a warmer method of clothing.

On Lake Champlain, and ſome other waters, and where running ſtreams have been converted into nearly ſtagnant ponds, intermittents frequently prevail. But this diſeaſe is ſeldom known within 30 or 40 miles of the ſea coaſt. In ſome of the elevated parts of Vermont, and in a few places in the weſtern parts of New-Hampſhire, children, women, and ſome men of delicate conſtitutions, are affected with ſwellings on the throat. This effect is aſcribed to their drinking brook and river water. Boſton, Providence, Newburyport, and a few other places on the ſea coaſt, and in the interior country, have been viſited with the yellow fever.

A late writer (A) has obſerved, that "in other countries, men are divided according to their wealth or indigence, into three claſſes; the opulent, the middling, and the poor; the idleneſs, luxuries and debaucheries of the firſt, and the miſery and too frequent intemperance of the laſt, deſtroy the greater proportion of theſe two. The intermediate claſs is below thoſe indulgencies which prove fatal to the rich, and above thoſe ſufferings to which the unfortunate poor fall victims: this is therefore the happieſt diviſion of the three. Of the rich and poor, the American Republic furniſhes a much ſmaller proportion than any other diſtrict of the known world. In Connecticut particularly, the diſtribution of wealth and its concomitants is more equal than elſewhere, and therefore, as far as exceſs or want of wealth may prove deſtructive or ſalutary to life, the inhabitants of this ſtate may plead exemption from diſeaſes."— What this writer ſays of Connecticut in particular, will, with very few exceptions, apply to New-England at large.

Soil.

The ſoil of New-England is diverſified by every variety, from a lean and barren ſand, to the richeſt clays and loams. The firſt great diviſion of ſoil is a brown loam every where mixed with gravel. With this the hills, which conſtitute a great proportion of the whole ſurface, are univerſally covered. This ſoil is always favourable to the production of graſs, and in the weſtern parts of the country (when not too moiſt) of wheat and all other kinds of grain, and of every kind of fruit ſuited to the climate. Maize, or Indian corn, grows well, even on the wet grounds, where this ſoil exiſts.

Clayey ſoils are more rarely found, and are alſo very productive, eſpecially when manured. A rich loam, varying towards clay, begins at Guilford and Branford in Connecticut, and ſpreads through the whole breadth of that ſtate, terminating in Weſt Springfield. The ſame ſoil prevails alſo in Saliſbury and Sharon, and covers about one quarter of the weſtern half of Connecticut. This ſoil, wherever it exiſts, is favourable to every kind of cultivation, and is ſurpaſſed in goodneſs by no land in this country.

Sand prevails very commonly on the plains, and abounds in the ſouth-eaſtern part of Maſſachuſetts, in the old colony of Plymouth. The yellow pine plains are commonly a mixture of ſand and gravel; are light and warm, and friendly to every production which does not demand a richer ſoil. The white pine plains are uſually covered with loam, as are ſome of the yellow pine plains, and are not unfrequently fertile. The vallies, almoſt without exception, are a rich mould, and friendly to every growth of the climate.

The intervals, which border the various ſtreams, are uſually lands formed by earth depoſited by the floods (or, as they are called, freſhets) in the ſpring, and are of the richeſt quality. Marſhes, except of trifling extent, are rare. The moſt conſiderable are around New-Haven, and along the eaſtern coaſt of Maſſachuſetts and New-Hampſhire.

Rivers.

The principal rivers of New-England are the Schoduc, Penobſcot, Kennebec, Amariſcoggin, Saco, Piſcataqua, Merrimack, Parkers, Charles, Taunton, Providence, Thames, Connecticut, Hooeſtonnuc, or Stratford, Onion, La Moille, and Miſſiſcoui. Penobſcot, Kennebec, Merrimac and Connecticut are the largeſt.

Innumerable ſmaller rivers divide the country in every direction, enrich the ſoil, adorn the landſcape, and furniſh mill ſeats to almoſt every village. Windmills are erected in very few places. The principal rivers will be deſcribed under their proper heads.

Lakes, Ponds and Harbours.

The principal lakes are Champlaine and Memphremagog, lying partly in Vermont and partly in New-York; Winnipiſeogee and Umbagog, in New-Hampſhire; Sebago, Mooſehead, Willeguenguagun, and Chilmacook or Grand Lake, in Maine. Small lakes, commonly

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(A) Dr Foolke, in a diſcourſe read before the American Philoſophical Society.

commonly called ponds, of every ſize, are ſcattered throughout the country. Springs and ſmall brooks water almoſt every farm.

Harbours abound in Maine and Maſſachuſetts. The moſt uſeful ones at preſent, are thoſe of Machias, Frenchman's Bay, Wiſcaſſet, Portland, and Wells, in Maine; Piſcataqua, in New-Hampſhire; Newburyport, Salem, Marblehead, Boſton, Province Town, and New Bedford, in Maſſachuſetts proper; Newport, Briſtol, and Providence, in Rhode-Iſland; and New London, New-Haven, and Black Rock in Fairfield, in Connecticut. Burlington Bay is the moſt conſiderable harbour in Lake Champlaine, on the Vermont ſhore.

Productions.

The produce of the fields in New-England is of every kind ſuited to the climate. In the weſtern half, and in various parts of the eaſtern, wheat, before the ravages of the Heſſian fly, grew abundantly; but that inſect has not a little diſcouraged the culture of this grain. Indian corn is a moſt abundant and uſeful grain, furniſhing a very healthful and pleaſing food to the inhabitants, and yielding alſo the beſt means of fattening their numerous herds of cattle and ſwine. The kind, frequently called ſweet-corn, is perhaps the moſt delicious of all culinary vegetables, if eaten young, and one of the moſt ſalubrious. The juice of the corn-ſtalk yields a rich molaſſes, and a ſpirit not inferior to that of the ſugar cane. No cultivated vegetable makes ſo noble an appearance in the field.—Fruits of every kind, which ſuit a temperate climate, abound, or may be eaſily made to abound here. The heat of the ſummer brings to high perfection the peach, apricot, and nectarine. The orchards of apple-trees cover a conſiderable part of the whole country, except the new ſettlements. Cider is the common drink of the inhabitants of every claſs, and may often be obtained, in the interior country, by paying for the labour of gathering the apples and making the cider. Pears, plums, cherries, currants, gooſeberries, whortleberries, blackberries, bilberries, &c. abound. Perry is made in ſome parts of the country, but not in great quantities. Butternuts, ſhagbarks, and various other fruits of the different ſpecies of the hickory and hazle-nuts, are plentifully furniſhed by the ſouthern half of New-England. Madeira nuts and black walnuts are rarely cultivated, although the laſt grow very eaſily and rapidly. Hortuline productions are alſo abundant, of every kind found in this climate, and grow with very little care or culture. Gardening is much improved, and ſtill advancing; many good gardens are ſeen in almoſt every quarter of New-England. But the moſt important production of New-England is graſs. This not only adorns the face of the country, with a beauty unrivalled in the new world, but alſo furniſhes more wealth and property to its inhabitants than any other kind of vegetation. A farm of two hundred acres of the beſt grazing land, is worth, to the occupier, as much as a farm of three hundred acres of the beſt tillage land. The reaſon is obvious. Far leſs labour is neceſſary to gather the produce, and convey it to market.

The beef and pork of New England are abundant and excellent, and feed the inhabitants of many other countries. The mutton is alſo exquiſite, when well fed, and of the proper age; but it muſt be confeſſed, that, except in a part of the eaſtern half of this country, it is very often brought to market too young and indifferently fed, to the injury of both the farmer and the conſumer. The lamb is univerſally fine, but is moſt excellent in the ſtates of New-Hampſhire and Vermont; and particularly in the parts of theſe ſtates which border on Connecticut river. A great diſcouragement to the raiſing of ſheep, exiſts in a kind of encloſure which is extenſive, the ſtone wall: over this wall ſheep paſs with great eaſe, and cannot, without much difficulty and labour, be prevented from intruding into all the parts of a farm, wherever this kind of fence is in uſe. This evil, which is not a ſmall one, will, however, be probably removed by increaſing the new breed of ſheep, called the *Otter breed*. Theſe ſheep, which, it is ſaid, began in an extraordinary manner, at Mendon, in Maſſachuſetts (of which a ſufficiently correct account to be inſerted here has not been received), have legs ſomewhat reſembling thoſe of a hare; and while they are not inferior to the common breed, in fleſh or wool, are unable to climb any fence; a circumſtance which, in New-England, confers on them a peculiar value.—The wool of the New-England ſheep is of a good ſtaple, and may be improved (as it often has been by attentive farmers) to a high, but indefinite degree. The beſt wool, and the beſt mutton alſo are furniſhed by ſhort and ſweet paſtures, and in dry ſeaſons.

The veal of New-England is extremely rich and fine when well fed, as it is to a great extent.

Butter and cheeſe, in this country, are made in vaſt quantities, and of various goodneſs. The butter is very generally excellent, but is ſtill very commonly rendered ſenſibly worſe in the firkin, by the imperfect manner in which it is prepared. A great quantity of ordinary cheeſe is ſhipped yearly, to the diſadvantage of both the maker and the merchant. There is alſo a great quantity of cheeſe of a ſuperior quality made throughout the country. The dairies in Pomfret and Brooklyn, and a few of the neighbouring towns in the eaſtern part of Connecticut, are probably more generally of the firſt claſs, than in any other quarter.

Foreſts.

Of the foreſts of New-England, and not improbably of the world, the white pine is the firſt ornament: The greateſt diameter of this extraordinary tree does not exceed ſix feet, but its height, in ſome inſtances, exceeds two hundred and ſixty. This vaſt ſtem is often exactly ſtraight, and tapering, and without a limb, to the height of more than one hundred and fifty feet. The colour and form of the foliage are exquiſite; and the whole crown is noble beyond any thing of this kind, and perfectly ſuited to the ſtem which it adorns. The murmurs of the wind in a grove of white pines, is one of the firſt poetical objects in the field of nature. This tree is of vaſt importance for building. The white oak of New-England is a noble and moſt uſeful tree. It is leſs enduring than the live, or the Engliſh oak; but the early decay of ſhips, built of the white oak, ſo generally complained of, is leſs owing to the nature of the tree, than to the haſte and careleſſneſs of the builders.—When the timber has been well ſelected and ſeaſoned, ſhips formed of this material, have come near to the age of thoſe built of the Engliſh oak. The cheſnut is alſo of incalculable importance as a material in the conſtruction of buildings, and for fencing. A fence compoſed of good rails of this tree, will endure ſeventy or eighty years. The cheſnut is very common throughout the ſouthern half of New-England, and is of no ſmall value, on account of the nouriſhment it affords to ſwine during their growth.

The country likewiſe abounds in a very great variety of flowering ſhrubs and plants, many of which are not only beautiful but highly uſeful.

Population and character.

New-England is the moſt populous part of the United States. It contained, in 1790, 1,009,522 ſouls, and in 1800, 1,233,011. The great body of theſe are landholders and cultivators of the ſoil. As they poſſeſs, in fee ſimple, the farms which they cultivate, they are naturally all attached to their country; the cultivation of the ſoil makes them robuſt and healthy, and enables them to defend it.

New-England may, with propriety, be called a nurſery of men, whence are annually tranſplanted, into other parts of the United States, thouſands of its natives. Vaſt numbers of them, ſince the war, have emigrated into the northern parts of New-York, into Canada, Kentucky, the Weſtern Territory, and Georgia; and indeed into every ſtate, and every town of note in the Union.

The inhabitants of New-England are almoſt univerſally of Engliſh deſcent; and it is owing to this circumſtance, and to the great and general attention that has been paid to education, that the Engliſh language has been preſerved among them ſo free from corruption.

The New-Englanders are generally tall, ſtout, and well built. Their education, laws and ſituation, ſerve to inſpire them with high notions of liberty. Their jealouſy is awakened at the firſt motion towards an invaſion of their rights. They are indeed often jealous to exceſs; a circumſtance which is a fruitful ſource of imaginary grievances, and of groundleſs ſuſpicions and complaints againſt government. But theſe ebullitions of jealouſy, though cenſurable, and productive of ſome political evils, ſhew that the eſſence of true liberty exiſts in New-England; for watchfulneſs is a guardian of liberty, and a characteriſtic of free republicans. A chief foundation of freedom in the New-England ſtates, is a law by which inteſtate eſtates deſcend to all the children, or other heirs, in equal proportions. In conſequence of theſe laws, the people of New-England enjoy an equality of condition unknown in any other part of the world: And it is in this way that the people have preſerved that happy mediocrity among themſelves, which, by inducing economy and induſtry, removes from them temptations to luxury, and forms them to habits of ſobriety and temperance. At the ſame time, their induſtry and frugality exempt them from want, and from the neceſſity of ſubmitting to any encroachments on their liberties.

In New-England, learning is more generally diffuſed among all ranks of people than in any other part of the United States; a fact ariſing from the excellent eſtabliſhment of ſchools in every town.

In theſe ſchools, which are generally ſupported by a public tax, and under the direction of a ſchool committee, are taught the elements of reading, writing and arithmetic; and in the more wealthy towns, they are beginning to introduce the higher branches of grammar, geography, &c.

A very valuable ſource of information to the people is the newſpapers, of which not leſs than 30,000 are printed every week in New-England, and circulated in almoſt every town and village in the country. (A)

A perſon of mature age, who cannot both read and write, is rarely to be found. By means of this general eſtabliſhment of ſchools, the extenſive circulation of newſpapers, and the conſequent diffuſion of learning, every townſhip throughout the country is furniſhed with men capable of conducting the affairs of their town with judgment and diſcretion: Theſe men are the channels of political information to the lower claſs of people, if ſuch a claſs may be ſaid to exiſt in New-England, where every man thinks himſelf at leaſt as good as his neighbour. The people, from their childhood, form habits of canvaſſing public affairs, and commence politicians. This naturally leads them to be very inquiſitive. It is with knowledge as with riches, the more a man has, the more he wiſhes to obtain; his deſire has no bound. This deſire after knowledge, in a greater or leſs degree, prevails throughout all claſſes of people in New-England; and, from their various modes of expreſſing it, ſome of which are blunt and familiar, bordering on impertinence, ſtrangers have been induced to mention *impertinent inquiſitiveneſs* as a diſtinguiſhing characteriſtic of New-England people. But this inquiſitiveneſs is rarely troubleſome, and generally pleaſing. The common people in New-England are outdone by no common people in the world, in civility to ſtrangers.

Before the late war, which introduced into New-England a flood of corruptions, together with many improvements, the Sabbath was obſerved with great ſtrictneſs; no unneceſſary travelling, no ſecular buſineſs, no viſiting, no diverſions were permitted on that ſacred day. The people conſidered it as conſecrated to divine worſhip, and were generally punctual and ſerious in their attendance upon it. Their laws were ſtrict in guarding the Sabbath againſt every innovation. The ſuppoſed ſeverity with which theſe laws were compoſed and executed, together with ſome other traits in their religious character, have acquired for the New-Englanders the name of a ſuperſtitious, bigotted people. But all perſons are called ſuperſtitious by thoſe leſs conſcientious, and leſs diſpoſed to regard religion with reverence, than themſelves. Since the war, a catholic, tolerant ſpirit, occaſioned by a more enlarged intercourſe with mankind, has greatly increaſed, and is becoming univerſal: And if they do not go beyond the proper bound, and liberalize away all true religion, of which there is very great danger, they will counteract that ſtrong propenſity in human nature, which leads men to vibrate from one extreme to its oppoſite.

There is one diſtinguiſhing characteriſtic in the religious character of this people, which we muſt not omit to mention; and that is, the cuſtom of annually celebrating faſts and thankſgivings. In the ſpring, the

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(A) In 1798, there were one hundred and twenty different newſpapers printed in the United States, many of them daily papers, and more printed twice a week. In 1788, it was eſtimated, that no leſs than *four millions* of newſpapers were circulated through the country every year. They have probably nearly doubled ſince.

the governors of the ſeveral New-England ſtates, except Rhode-Iſland, iſſue their proclamations, appointing a day to be religiouſly obſerved in faſting, humiliation and prayer, throughout their reſpective ſtates; in which the predominating vices, that particularly call for humiliation, are enumerated. In autumn, after harveſt, that gladſome era in the huſbandman's life, the governors again iſſue their proclamations, appointing a day of public thankſgiving, enumerating the public bleſſings received in the courſe of the foregoing year.

This pious cuſtom originated with their venerable anceſtors, the firſt ſettlers of New-England; and has been handed down as ſacred, through the ſucceſſive generations of their poſterity. A cuſtom ſo rational, and ſo happily calculated to cheriſh in the minds of the people, a ſenſe of their dependence on the GREAT BENEFACTOR of the world for all their bleſſings, it is hoped will ever be ſacredly preſerved.

The people of New England generally obtain their eſtates by hard and perſevering labour: they of conſequence know their value, and are frugal. Yet in no country do the indigent and unfortunate fare better. Their laws oblige every town to provide a competent maintenance for their poor, and the neceſſitous ſtranger is protected and relieved by their humane inſtitutions. It may in truth be ſaid, that in no part of the world are the people happier, better furniſhed with the neceſſaries and conveniences of life, or more independent than the farmers in New England. As the great body of the people are hardy, independent freeholders, their manners are, as they ought to be, congenial to their employment, plain, ſimple, and manly. Strangers are received and entertained among them with a great deal of artleſs ſincerity, and friendly, plain hoſpitality. Their children, thoſe imitative creatures, to whoſe education particular attention is paid, early imbibe the manners and habits of thoſe around them; and the ſtranger, with pleaſure, notices the honeſt and decent reſpect that is paid him by the children as he paſſes through the country.

As the people, by repreſentation, make their own laws and appoint their own officers, they cannot be oppreſſed; and, living under governments which have few lucrative places, they have few motives to bribery, corrupt canvaſſings, or intrigue. Real abilities and a moral character unblemiſhed, are the qualifications requiſite in the view of moſt people, for officers of public truſt. The expreſſion of a wiſh to be promoted, was, and is ſtill, in ſome parts of New England, the direct way to be diſappointed.

The inhabitants are generally fond of the arts and ſciences, and have cultivated them with great ſucceſs. Their colleges have flouriſhed. The illuſtrious characters they have produced, who have diſtinguiſhed themſelves in politics, law, divinity, the mathematics and philoſophy, natural and civil hiſtory, and in the fine arts, particularly in poetry and painting, evince the truth of theſe obſervations.

Many of the women in New England are handſome. They generally have fair, freſh and healthful countenances, mingled with much female ſoftneſs and delicacy. Thoſe who have had the advantages of a good education, and they are numerous, are genteel, eaſy, and agreeable in their manners, and are ſprightly and ſenſible in converſation. They are early taught to manage domeſtic concerns with neatneſs and economy. Ladies of the firſt diſtinction and fortune, make it a part of their daily buſineſs to ſuperintend the affairs of the family. Employment at the needle, in cookery, and at the ſpinning wheel, with them is honourable. Idleneſs, even in thoſe of independent fortunes, is univerſally diſreputable. The women in country towns, manufacture the greater part of the clothing of their families. Their linen and woollen cloths are ſtrong and decent. Their butter and cheeſe is not inferior to any in the world.

Among the amuſements of the people of New England is dancing, of which the young people of both ſexes are extremely fond. Gaming is practiſed by none but thoſe who cannot, or rather will not, find a *reputable* employment. The gameſter, the horſe-jockey, and the knave, are equally deſpiſed, and their company is avoided by all who would ſuſtain fair and irreproachable characters.

The athletic and healthy diverſions of cricket, football, quoits, wreſtling, jumping, hopping, foot races, and priſon baſs are univerſally practiſed in the country, and ſome of them in the moſt populous places, and by people of almoſt all ranks.

In New England there are eight colleges, 1 in Connecticut, 1 in Rhode-Iſland, 2 in Maſſachuſetts, 1 in Maine, 1 in New Hampſhire, 2 in Vermont, containing, in the whole about a thouſand ſtudents, and the number is annually increaſing. There are about three times the number of reſpectable academies, ſcattered at convenient diſtances, through the country, containing not leſs than two thouſand ſcholars, and a great number of grammar ſchools, in which the dead languages are taught; beſides common *free ſchools* already mentioned, in every village and neighbourhood in New England.

For promoting general ſcience, there have been inſtituted the American academy of arts and ſciences, and the Maſſachuſetts hiſtorical ſociety at Boſton, and the Connecticut academy of arts and ſciences, at New Haven. For the advancement of agricultural knowledge, ſeveral ſocieties have been eſtabliſhed, and many others have been formed for various charitable and humane purpoſes.

The people of New England are Proteſtant chriſtians, excepting a few Jews, who have a ſynagogue in Newport, and a ſmall ſociety of Roman Catholics, in Boſton. The Proteſtants are divided into congregationaliſts, which is the prevailing denomination, Epiſcopalians, Baptiſts, Friends or Quakers, Methodiſts, and a few Univerſaliſts. As in other parts of the United States, ſo in the part we are deſcribing, there are numbers who have their religion yet to chooſe.—They have *liberty*, but no *religion*.

The clergy of New England are a numerous body of men, and, generally ſpeaking, are reſpectable for their piety, pure morals, learning and uſeful induſtry, and live in great harmony and affection with their people. The cauſe of general literature is much indebted to their labours. Probably eight-tenths of the publications, in New England from its firſt ſettlement, have been from the pens of the Clergy.

The number and pious exertions, of miſſionary ſocieties of which ſeven or eight are inſtituted in the different

ent States, ſome of them patronized by the government, do honour to the religious character of New England. At the expenſe, and under the direction of theſe ſocieties, a large number of miſſionaries are annually ſent among the frontier ſettlers, who are deſtitute of the means of religious inſtruction. The buſineſs of miſſionaries, is to inſtruct from houſe to houſe, to preach publicly, to adminiſter ordinances, and diſtribute bibles and various other religious books. The good effects which have followed theſe exertions, in preſerving and cheriſhing the early religious habits of theſe people, and guarding them againſt the poiſon of infidelity and vice, have been great beyond calculation.

Boſton is the largeſt town in New England, and may be conſidered its capital. Beſides this are Salem, and Newburyport in Maſſachuſetts; Portland in Maine, Portſmouth in New Hampſhire, Bennington, Windſor, Rutland, in Vermont, Hartford, New Haven, and New London in Connecticut, and Providence and Newport in Rhode Iſland. See theſe deſcribed under their reſpective heads. Excluſive of thoſe above named, there are in New England upwards of 100 towns which have each more than 2000 inhabitants—many of which have three, four, or five thouſand.

New England is the moſt commercial part of the United States. Of ninety-three millions of dollars, the amount of exports from the United States in the year ending 30th Sept. 1801, New England exported 18,761,867 dollars, or about a fifth part of the whole. Her tonnage in 1798, amounted to 360,911 more than half the whole belonging to the United States. About 30,000 tons are uſually employed by Maſſachuſetts alone in carrying on the fiſheries; 50,000 in the coaſting buſineſs, and the remainder, to the amount of 281,436 tons (owned in Maſſachuſetts in 1798) in foreign trade to all parts of the world.—*Morſe.*

NEWENHAM, *Cape*, is the north point of Briſtol Bay, on the north-weſt coaſt of North-America. All along the coaſt the flood tide ſets ſtrongly to the north-weſt, and it is high water about noon on full and change days. N. lat. 58 42, W. long. 162 24.—*ib.*

NEW FAIRFIELD, the north-weſternmoſt townſhip in Fairfield county Connecticut.—*ib.*

NEW FANE, the chief town of Windham county, Vermont, is ſituated on Weſt river, a little to the north-weſt of Brattleborough. In has 660 inhabitants.—*ib.*

NEW GARDEN, a townſhip in Cheſter county, Pennſylvania.—*ib.*

New Garden, a ſettlement of the Friends in Guildford county, N. Carolina.—*ib.*

NEW GENEVA, a ſettlement in Fayette county, Pennſylvania.—*ib.*

NEW GERMANTOWN, a poſt-town of New-Jerſey, ſituated in Hunterdon county. It is 28 miles north-weſt of Brunſwick; 47 north by eaſt of Trenton, and 77 north-eaſt by north of Philadelphia.—*ib.*

NEW GLOUCESTER, a ſmall poſt-town in Cumberland county, Diſtrict of Maine, 27 miles northerly of Portland, and 146 north of Boſton. It was incorporated in 1774, and contains 1355 inhabitants.—*ib.*

NEW GOTTINGEN, a town of Georgia, ſituated in Burke county, on the weſt bank of Savannah river, about 18 miles eaſt of Wayneſborough, and 35 north-weſt of Ebenezer.—*ib.*

NEW GRANADA, a province in the ſouthern diviſion of Terra Firma, S. America, whoſe chief town is Santa Fe de Bagota.—*ib.*

NEW GRANTHAM, a townſhip in Cheſhire county, New Hampſhire, was incorporated in 1761, and contains 333 inhabitants, and is about 15 miles ſouth-eaſt of Dartmouth college.—*ib.*

NEW HAMPSHIRE, one of the United States of America, is ſituated between lat. 42 41 and 45 11 north, and between 70 40 and 72 28 weſt long. from Greenwich; bounded north by Lower Canada; eaſt by the Diſtrict of Maine; ſouth by Maſſachuſetts, and weſt by Connecticut river, which ſeparates it from Vermont. Its ſhape is nearly that of a right angled triangle. The Diſtrict of Maine and the ſea its leg, the line of Maſſachuſetts its perpendicular, and Connecticut river its hypothenuſe. It contains 9,491 ſquare miles, or 6,074,240 acres; of which at leaſt 100,000 acres are water. Its length is 168 miles; its greateſt breadth 90; and its leaſt breadth 19 miles.

This State is divided into 5 counties, viz. Rockingham, Strafford, Cheſhire, Hillſborough, and Grafton. The chief towns are Portſmouth, Exeter, Concord, Dover, Amherſt, Keen, Charleſtown, Plymouth, and Haverhill. Moſt of the townſhips are 6 miles ſquare, and the whole number of townſhips and locations is 214; containing 141,885 perſons, including 158 ſlaves. In 1767, the number of inhabitants were eſtimated at 52,700. This State has but about 18 miles of ſea-coaſt, at its ſouth-eaſt corner. In this diſtance there are ſeveral coves for fiſhing veſſels, but the only harbour for ſhips is the entrance of Piſcataqua river, the ſhores of which are rocky. The ſhore is moſtly a ſandy beach, adjoining to which are ſalt marſhes, interſected by creeks, which produce good paſture for cattle and ſheep. The intervale lands on the margin of the great rivers are the moſt valuable, becauſe they are overflowed and enriched by the water from the uplands which brings a fat ſlime or ſediment. On Connecticut river theſe lands are from a quarter of a mile to a mile and an half on each ſide, and produce corn, grain, and graſs, eſpecially wheat, in greater abundance and perfection than the ſame kind of ſoil does in the higher lands. The wide ſpreading hills are eſteemed as warm and rich; rocky moiſt land is accounted good for paſture; drained ſwamps have a deep mellow-ſoil; and the vallies between the hills are generally very productive. Agriculture is the chief occupation of the inhabitants; beef, pork, mutton, poultry, wheat, rye, Indian corn, barley, pulſe, butter, cheeſe, hops, eſculent roots and plants, flax, hemp, &c. are articles which will always find a market, and are raiſed in immenſe quantities in New Hampſhire, both for home conſumption and exportation. Apples and pears are the moſt common fruits cultivated in this State, and no huſbandman thinks his farm complete without an orchard. Tree fruit of the firſt quality, cannot be raiſed in ſuch a northern climate as this, without particular attention. New York, New Jerſey and Pennſylvania have it in perfection. As you depart from that tract, either ſouthward or northward, it degenerates. The uncultivated lands are covered with extenſive foreſts of pine, fir, cedar, oak, walnut, &c. New Hampſhire is interſected by ſeveral ranges of mountains. The firſt ridge, by the name of the Blue Hills, paſſes through Rocheſter, Barrington and Nottingham, and the ſeveral ſummits are diſtinguiſhed by different names. Behind theſe are ſeveral higher detached mountains. Farther back the mountains riſe ſtill higher, and among the third range, Chocorua, Oſſapy, and Kyarſarge, are the principal. Beyond theſe is the lofty ridge which divides the branches of Connecticut and Merrimack rivers, denominated the *Height of Land*. In this ridge is the celebrated Monadnock mountain. Thirty miles N. of which is Sunapee, and 48 miles further is Mooſehillock, called alſo Mooſhelock mountain. The ridge is then continued northerly, dividing the waters of the river Connecticut from thoſe of Saco, and Amariſcoggin. Here the mountains riſe much higher, and the moſt elevated ſummits in this range, are the White Mountains. The lands W. of this laſt mentioned range of mountains, bordering on Connecticut river, are interſperſed with extenſive meadows, rich and well watered. Oſſapy Mountain lies adjoining the town of Moultonborough on the N. E. In this town it is obſerved, that in a N. E. ſtorm the wind falls over the mountain, like water over a dam; and with ſuch force, as frequently to unroof houſes. People who live near theſe mountains, by noticing the various movements of attracted vapours, can form a pretty accurate judgment of the weather; and they hence ſtyle theſe mountains their Almanack. If a cloud is attracted by a mountain, and hovers on its top, they predict rain; and if, after rain, the mountain continues capped, they expect a repetition of ſhowers. A ſtorm is preceded for ſeveral hours by a roaring of the mountain, which may be heard 10 or 12 miles. But the White Mountains are undoubtedly the higheſt land in New England, and, in clear weather, are diſcovered before any other land, by veſſels coming in to the eaſtern coaſt; but by reaſon of their white appearance, are frequently miſtaken for clouds. They are viſible on the land at the diſtance of 80 miles, on the S. and S. E. ſides; they appear higher when viewed from the N. E. and it is ſaid, they are ſeen from the neighbourhood of Chamblee and Quebec. The Indians gave them the name of Agiocochook. The number of ſummits in this cluſter of mountains cannot at preſent be aſcertained, the country around them being a thick wilderneſs. The greateſt number which can be ſeen at once, is at Dartmouth, on the N. W. ſide, where ſeven ſummits appear at one view, of which four are bald. Of theſe the three higheſt are the moſt diſtant, being on the eaſtern ſide of the cluſter; one of theſe is the mountain which makes ſo majeſtic an appearance all along the ſhore of the eaſtern counties of Maſſachuſetts: it has lately been diſtinguiſhed by the name of MOUNT WASHINGTON. During the period of 9 or 10 months, theſe mountains exhibit more or leſs of that bright appearance, from which they are denominated white. In the ſpring, when the ſnow is partly diſſolved, they appear of a pale blue, ſtreaked with white; and after it is wholly gone, at the diſtance of 60 miles, they are altogether of the ſame pale blue, nearly approaching a ſky colour; while at the ſame time, viewed at the diſtance of 8 miles or leſs, they appear of the proper colour of the rock. Theſe changes are obſerved by people who live within conſtant view of them; and from theſe facts and obſervations, it may with certainty be concluded, that the whiteneſs of them is wholly cauſed by the ſnow, and not by any other white ſubſtance, for in fact there is none.

The moſt conſiderable rivers of this State are Connecticut, Merrimack, Piſcataqua, Saco, Androſcoggin, Upper and Lower Amonooſuck, beſides many other ſmaller ſtreams. The chief lakes are Winnipiſeogee, Umbagog, Sunapee, Squam, and Great Oſſipee. Before the war, ſhip-building was a ſource of conſiderable wealth to this State; about 200 veſſels were then annually built, and ſold in Europe and in the Weſt-Indies, but that trade is much declined. Although this is not to be ranked among the great commercial States, yet its trade is conſiderable. Its exports conſiſt of lumber, ſhip-timber, whale oil, flax-ſeed, live ſtock, beef, pork, Indian corn, pot and pearl aſhes, &c. &c. In 1790, there belonged to Piſcataqua 33 veſſels above 100 tons, and 50 under that burden. The tonnage of foreign and American veſſels cleared out from the 1ſt of October, 1789, to 1ſt of October, 1791, was 31,097 tons, of which 26,560 tons were American veſſels. The fiſheries at Piſcataqua, including the Iſle of Shoals, employ annually 27 ſchooners and 20 boats. In 1791, the produce was 25,850 quintals of cod and ſcale fiſh. The exports from the port of Piſcataqua in two years, viz. from 1ſt of October, 1789, to 1ſt of October, 1791, amounted to the value of 296,839 dollars, 51 cents; in the year ending September 30th, 1792, 181,407 dollars; in 1793, 198,197 dollars; and in the year 1794, 153,856 dollars. The bank of New Hampſhire was eſtabliſhed in 1792, with a capital of 60,000 dollars; by an act of aſſembly the ſtockholders can increaſe it to 200,000 dollars ſpecie, and 100,000 dollars, in any other eſtate. The only college in the State is at Hanover, called Dartmouth college, which is amply endowed with lands, and is in a flouriſhing ſituation. The principal academies are thoſe of Exeter, New Ipſwich, Atkinſon, and Amherſt. —*Morſe.*

NEW HAMPTON, a poſt-town of New Hampſhire, ſituated in Strafford county, on the W. ſide of Lake Winnipiſeogee, 9 miles S. E. of Plymouth, and 9 N. W. of Meredith. The townſhip was incorporated in 1777, and contains 652 inhabitants.—*ib.*

NEW HANOVER, a maritime county of Wilmington diſtrict, N. Carolina, extending from Cape Fear river north-eaſt along the Atlantic ocean. It contains 6831 inhabitants, including 3738 ſlaves. Chief town, Wilmington.—*ib.*

NEW HANOVER, a townſhip in Burlington county, New Jerſey, containing about 20,000 acres of improved land, and a large quantity that is barren and uncultivated. The compact part of the townſhip is called *New-Mills*, where are about 50 houſes, 27 miles from Philadelphia, and 13 from Burlington.—*ib.*

NEW HANOVER, a townſhip in Morgan county, Pennſylvania.—*ib.*

NEW HARTFORD, a ſmall poſt-town in Litchfield county, Connecticut, 14 miles N. E. of Litchfield, 20 W. by N. of Hartford.—*ib.*

NEW HAVEN *County*, Connecticut, extends along the Sound between Middleſex county, on the eaſt, and Fairfield county on the weſt; about 30 miles long from north to ſouth, and 28 from eaſt to weſt. It is divided into 14 townſhips. It contained in 1756, 17,955 free perſons, and 226 ſlaves; in 1774, 25,896 free perſons,

ſons, and 925 ſlaves; and in 1790, 30,397 free perſons, and 433 ſlaves.—*ib.*

New Haven, *(City)* the ſeat of juſtice in the above county, and the ſemi-metropolis of the State. This city lies round the head of a bay which makes up about 4 miles north from Long Iſland Sound. It covers part of a large plain which is circumſcribed on three ſides by high hills or mountains. Two ſmall rivers bound the city eaſt and weſt. It was originally laid out in ſquares of 60 rods; many of theſe ſquares have been divided by croſs ſtreets. Four ſtreets run north-weſt and ſouth-eaſt, and are croſſed by others at right angles. Near the centre of the city is the public ſquare, on and around which are the public buildings, which are a ſtate houſe, two college edifices, and a chapel, three churches for Congregationaliſts, and one for Epiſcopalians; all which are handſome and commodious buildings. The college edifices, chapel, ſtate-houſe, and one of the churches are of brick. The public ſquare is encircled with rows of trees, which render it both convenient and delightful. Its beauty, however, is greatly diminiſhed by the burial-ground, and ſeveral of the public buildings which occupy a conſiderable part of it. Many of the ſtreets are ornamented with rows of trees on each ſide, which give the city a rural appearance. The proſpect from the ſteeples is greatly variegated and extremely beautiful. There are between 3 and 400 neat dwelling-houſes in the city, principally of wood. The ſtreets are ſandy but clean. Within the limits of the city, are 4000 ſouls. About one in 70 die annually. Indeed as to pleaſantneſs of ſituation and ſalubrity of air, New Haven is hardly exceeded by any city in America. It carries on a conſiderable trade with New York and the Weſt India iſlands. The exports for one year, ending Sept. 30, 1794, amounted to the value of 171,868 dollars. Manufactures of card teeth, linen, buttons, cotton, and paper are carried on here. Yale college, which is eſtabliſhed in this city, was founded in 1700, and remained at Killingworth until 1707, then at Saybrook until 1716, when it was removed and fixed at New Haven. It has its name from its principal benefactor Governor Yale. There are at preſent ſix college *domiciles*, two of which, each 100 feet long and 40 wide, are inhabited by the ſtudents, containing 32 chambers each, ſufficient for lodging 120 ſtudents; a chapel 40 by 50 feet, with a ſteeple 130 feet high; a dining-hall 60 by 40 feet; a houſe for the preſident, and another for the profeſſor of divinity. In the chapel is lodged the public library, conſiſting of about 3000 volumes, and the philoſophical apparatus, as complete as moſt others in the United States, and contains the machines neceſſary for exhibiting experiments in the whole courſe of experimental philoſophy and aſtronomy. The muſeum, to which additions are conſtantly making, contains many natural curioſities. From the year 1700 to 1793, there have been educated and graduated at this univerſity about 2,303. The number of ſtudents is generally 150. The harbour, though inferior to New London, has good anchorage, with 3 fathom and 4 feet water at common tides, and 2½ fathom at low water. This place and Hartford are the ſeats of the legiſlature alternately. It is 40 miles S. W. by S. of Hartford, 54 from New London, 88 from New-York, 152 from Boſton, and 183 north-eaſt of Philadelphia. N. lat. 41 18, W. long. 72 56.—*ib.*

New Haven, a townſhip in Addiſon county, Vermont, on Otter Creek or River, containing 723 inhabitants.—*ib.*

NEW HEBRIDES, a cluſter of iſlands in the Pacific Ocean, ſo called by Capt. Cook in 1794—the ſame as the *Archipelago of the Great Cyclades* of Bougainville, or the *Terra Auſtral* of Quiros.—*ib.*

NEW HAMPSTEAD, a townſhip in Orange county, New York, bounded eaſterly by Clarkſtown, and ſoutherly by the ſtate of New Jerſey. It was taken from Haverſtraw, and incorporated in 1791. By the ſtate cenſus of 1796, there were 245 of its inhabitants qualified electors.—*ib.*

NEW HOLDERNESS, a townſhip in Grafton county, New Hampſhire, ſituated on the E. ſide of Pemigewaſſet river, about 3 miles E. by S. of Plymouth. It was incorporated in 1761, and contains 329 inhabitants.—*ib.*

NEW HOLLAND, a town of Pennſylvania, Lancaſter county, in the midſt of a fertile country. It contains a German church and about 70 houſes. It is 12 miles E. N. E. of Lancaſter, and 54 W. N. W. of Philadelphia.—*ib.*

NEW HUNTINGTON, a mountainous townſhip in Chittenden county, Vermont, on the S. W. ſide of Onion river, containing 136 inhabitants.—*ib.*

NEWINGTON, a townſhip; formerly part of Portſmouth and Dover, in Rockingham county, New Hampſhire. It contains 542 inhabitants.—*ib.*

NEW INVERNESS, in Georgia, is ſituated near Darien on Alatamaha river. It was built by the Scotch Highlanders, 160 of whom landed here in 1735.—*ib.*

NEW IPSWICH, a townſhip in Hillſborough county, New Hampſhire, on the W. ſide of Souhegan river, upon the ſouthern line of the State. It was incorporated in 1762, and contains 1241 inhabitants. There is an academy, founded in 1789, having a fund of about £1,000, and has generally about 40 or 50 ſtudents. It is about 24 miles S. E. of Keene, and 75 W. S. W. of Portſmouth.—*ib.*

NEW JERSEY, one of the United States of America, is ſituated between 39 and 41 24 N. latitude, and between 74 44 and 75 33 W. longitude from London; bounded E. by Hudſon's river and the Ocean; W. by Delaware Bay and river, which divide it from the States of Delaware and Pennſylvania; N. by the line drawn from the mouth of Mahakkamak river, in lat. 41 24 to a point on Hudſon's river, in lat. 41. It is about 160 miles long and 52 broad, containing about 8,320 ſquare miles, equal to 5,324,800 acres. It is divided into 13 counties, *viz.* Cape May, Cumberland, Salem, Glouceſter, Burlington, Hunterdon, and Suſſex; theſe 7 lie from S. to N. on Delaware river; Cape May and Glouceſter extend acroſs to the ſea; Bergen, Eſſex, Middleſex, and Monmouth, lie from N. to S. on the eaſtern ſide of the State; Somerſet and Morris are inland counties. The number of inhabitants is 184,139, of whom 11,423 are ſlaves. The moſt remarkable bay is Arthur Kull, or Newark Bay, formed by the union of Paſſaick and Hackinſac rivers. The rivers in this State though not large, are numerous. A traveller in paſſing the common road from New York to Philadelphia, croſſes 3 conſiderable rivers, *viz.* the Hackinſac and Paſſaick, between Bergen and Newark, and the Rariton by

Brunſwick. Paſſaick is a very crooked river. It is navigable about 10 miles, and is 230 yards wide at the ferry. The cataract, or Great Falls, in this river, is one of the greateſt natural curioſities in the State. The river is about 40 yards wide, and moves in a ſlow, gentle current, until coming within a ſhort diſtance of a deep cleft in a rock, which croſſes the channel, it deſcends and falls above 70 feet perpendicularly, in one entire ſheet. One end of the cleft, which was evidently made by ſome violent convulſion in nature, is cloſed; at the other, the water ruſhes out with incredible ſwiftneſs, forming an acute angle with its former direction, and is received into a large baſon, whence it takes a winding courſe through the rocks, and ſpreads into a broad ſmooth ſtream. The cleft is from 4 to 12 feet broad. The falling of the water occaſions a cloud of vapour to ariſe, which, by floating amidſt the ſun-beams, preſents rainbows to the view, which adds beauty to the tremendous ſcene. The new manufacturing town of Patterſon is erected upon the Great Falls in this river. Rariton river is formed by two conſiderable ſtreams, called the north and ſouth branches; one of which has its ſource in Morris, the other in Hunterdon county. It paſſes by Brunſwick and Amboy, and mingling with the waters of the Arthur Kull Sound, helps to form the fine harbour of Amboy. Bridges have lately been erected over the Paſſaick, Hackinſac and Rariton rivers, on the poſt-road between New-York and Philadelphia. Theſe bridges will greatly facilitate the intercourſe between theſe two great cities. The counties of Suſſex, Morris, and the northern part of Bergen, are mountainous. As much as five-eighths of moſt of the ſouthern counties, or one-fourth of the whole State, is almoſt entirely a ſandy barren, unfit in many parts for cultivation. All the varieties of ſoil, from the worſt to the beſt kind, may be found here. The good land in the ſouthern counties lies principally on the banks of rivers and creeks. The barrens produce little elſe but ſhrub-oaks and yellow pines. Theſe ſandy lands yield an immenſe quantity of bog iron ore, which is worked up to great advantage in the iron-works in theſe counties. In the hilly and mountainous parts which are not too rocky for cultivation, the ſoil is of a ſtronger kind, and covered in its natural ſtate with ſtately oaks, hickories, cheſnuts, &c. and when cultivated, produces wheat, rye, Indian corn, buckwheat, oats, barley, flax, and fruits of all kinds, common to the climate. The land in this hilly country is good for grazing, and farmers feed great numbers of cattle for New-York and Philadelphia markets. The orchards in many parts of the State equal any in the United States, and their cyder is ſaid, and not without reaſon, to be the beſt in the world. The markets of New York and Philadelphia, receive a very conſiderable proportion of their ſupplies from the contiguous parts of New-Jerſey. Theſe ſupplies conſiſt of vegetables of many kinds, apples, pears, peaches, plums, ſtrawberries, cherries and other fruits—cyder in large quantities, butter, cheeſe, beef, pork, mutton, and the leſſer meats. The trade is carried on almoſt ſolely with and from thoſe two great commercial cities, New-York on one ſide, and Philadelphia on the other; though it wants not good ports of its own. Manufactures here have hitherto been inconſiderable, not ſufficient to ſupply its own conſumption, if we except the articles of iron, nails, and leather. A ſpirit of induſtry and improvement, particularly in manufactures, has however, of late, greatly increaſed. The iron manufacture is, of all others, the greateſt ſource of wealth to the State. Iron-works are erected in Glouceſter, Burlington, Suſſex, Morris, and other counties. The mountains in the county of Morris give riſe to a number of ſtreams, neceſſary and convenient for theſe works, and at the ſame time furniſh a copious ſupply of wood and ore of a ſuperior quality. In this county alone, are no leſs than 7 rich iron mines, from which might be taken ore ſufficient to ſupply the United States; and to work it into iron, there are 2 furnaces, 2 rolling and ſlitting mills, and about 30 forges, containing from 2 to 4 fires each. Theſe works produce annually, about 540 tons of bar iron, 800 tons of pigs, beſides large quantities of hollow ware, ſheet iron, and nail rods. In the whole State it is ſuppoſed there is yearly made about 1200 tons of bar iron, 1200 do. of pigs, 80 do. of nail-rods, excluſive of hollow ware, and various other caſtings, of which vaſt quantities are made. The inhabitants are a collection of Low Dutch, Germans, Engliſh, Scotch, Iriſh, and New-Englanders, and their deſcendants. National attachment, and mutual convenience, have generally induced theſe ſeveral kinds of people to ſettle together in a body, and in this way their peculiar national manners, cuſtoms and character, are ſtill preſerved, eſpecially among the poorer claſs of people, who have little intercourſe with any but thoſe of their own nation. The people of New-Jerſey are generally induſtrious, frugal, and hoſpitable. There are in this ſtate, about 50 Preſbyterian congregations, ſubject to the care of 3 Preſbyteries; beſides upwards of 40 congregations of Friends, 30 of Baptiſts, 25 of Epiſcopalians, 28 of Dutch Reformed, beſides Methodiſts, and a ſettlement of Moravians. All theſe religious denominations live together in peace and harmony; and are allowed, by the conſtitution of the State, to worſhip Almighty God agreeably to the dictates of their own conſciences. The college at Princeton, called Naſſau Hall, has been under the care of a ſucceſſion of Preſidents, eminent for piety and learning; and has furniſhed a number of Civilians, Divines, and Phyſicians, of the firſt rank in America. It has conſiderable funds, is under excellent regulations, and has generally from 80 to 100 ſtudents, principally from the ſouthern ſtates. There are academies at Freehold, Trenton, Hackinſack, Orangedale, Elizabeth-Town, Burlington, and Newark; and grammar ſchools at Springfield, Morriſtown, Bordentown, and Amboy. There are a number of towns in this State, nearly of equal ſize and importance, and none that has more than 300 houſes compactly built. Trenton is one of the largeſt, and the capital of the ſtate. The other principal towns are Brunſwick, Burlington, Amboy, Bordentown, Princeton, Elizabeth-Town, Newark, and Morriſtown. This ſtate was the ſeat of war for ſeveral years, during the bloody conteſt between Great-Britain and America. Her loſſes both of men and property, in proportion to the population and wealth of the State, was greater than of any other of the Thirteen States. When General Waſhington was retreating through the Jerſies, almoſt forſaken by all others, her militia were at all times obedient to his orders; and, for a conſiderable length of time, compoſed the ſtrength of his army. There is hardly a town in the ſtate that lay in the progreſs of the Britiſh army, that was not rendered ſignal, by ſome enterpriſe or exploit.—*ib.*

NEW KENT, a county of Virginia, bounded on the S. ſide of Pamunky and York rivers. It is about 33 miles long, and 12 broad, and contains 6,239 inhabitants, including 3,700 ſlaves. New Kent court houſe is 30 miles from Richmond, and as far from Williamſburg.—*ib.*

NEW LEBANON, a poſt town in Dutcheſs county, New York, celebrated for its medicinal ſprings. The compact part of this town is pleaſantly ſituated partly in an extenſive valley, and partly on the declivity of the ſurrounding hills. The ſpring is on the ſouth ſide, and near the bottom of a gentle hill, but a few rods weſt of the Maſſachuſetts weſt line; and is ſurrounded with ſeveral good houſes, which afford convenient accommodations for the valetudinarians who viſit theſe waters. Concerning the medicinal virtues of this ſpring, Dr Waterhouſe, Profeſſor of the theory and practice of phyſic, at Harvard Univerſity, and who viſited it in the ſummer of 1794, obſerves, "I confeſs myſelf at a loſs to determine the contents of theſe waters by chymical analyſis, or any of the ordinary teſts. I ſuſpect their impregnation is from ſome cauſe weakened. Excepting from their warmth, which is about that of new milk, I never ſhould have ſuſpected them to come under the head of medicinal waters. They are uſed for the various purpoſes of cookery, and for common drink by the neighbours, and I never could diſcover any other effects from drinking them, than what we might expect from rain or river water of that temperature. There was no viſible change produced in this water by the addition of an alkali, nor by a ſolution of alum; nor was any efferveſcence raiſed by the oil of vitriol; neither did it change the colours of gold, ſilver, or copper; nor did it redden beef or mutton boiled in it; nor did it extract a black tincture from galls; neither did it curdle milk, the whites of eggs, or ſoap. The quality of the waters of the pool at Lebanon is, therefore, very different from thoſe of Saratoga. Theſe are warm and warmiſh, thoſe very cold, ſmart, and exhilarating. Frogs are found in the pool of Lebanon, and plants grow and flouriſh in and around it; but plants will not grow within the vapour of thoſe of Saratoga, and as for ſmall animals, they ſoon expire in it. Hence we conclude that that *ſpiritus mineralis* which ſome call aerial acid, or fixed air, abounds in the one but not in the other. Yet the Lebanon pool is famous for having wrought many cures, eſpecially in rheumatiſms, ſtiff joints, ſcabby eruptions, and even in viſceral obſtructions and indigeſtions; all of which is very probable. If a perſon who has brought on a train of chronic complaints, by intemperance in eating and drinking, ſhould ſwallow four or five quarts of rain or river water in a day, he would not feel ſo keen an appetite for animal food, or thirſt for ſpirituous liquors. Hence ſuch a courſe of water drinking will open obſtructions, rinſe out impurities, render perſpiration free, and thus remove that unnatural load from the animal machine, which cauſes and keeps up its diſorders. Poſſibly, however, there may be *ſomething* ſo ſubtle in theſe waters as to elude the ſcrutinizing hand of the chymiſts, ſince they all allow that the analyſis of mineral waters is one among the moſt difficult things in the chymical art." A ſociety of *Shakers* inhabit the ſouth part of the town in view of the main ſtage-road, which paſſes through this town. Their manufactures of various kinds are conſiderable, and very neat and excellent. It is about 32 miles E. by S. of Albany, 103 north of New-York, and 6 W. of Pittsfield.—*ib.*

NEWLIN, a townſhip in Cheſter county, Pennſylvania.—*ib.*

NEW LONDON, a maritime county of Connecticut, comprehending the S. E. corner of it, bordering E. on Rhode-Iſland, and S. on Long-Iſland Sound, about 30 miles from E. to W. and 24 from north to ſouth. It was ſettled ſoon after the firſt ſettlements were formed on Connecticut river; and is divided into 11 townſhips, of which New-London and Norwich are the chief. It contained in 1756, 22,844 inhabitants, of whom 829 were ſlaves; in 1790, 33,200, of whom 586 were ſlaves.—*ib.*

NEW LONDON, a city, port of entry, and poſt-town in the above county, and one of the moſt conſiderable commercial towns in the State. It ſtands on the W. ſide of the river Thames, about 3 miles from its entrance into the Sound, and is defended by Fort Trumbull and Fort Griſwold, the one on the New London, the other on the Groton ſide of the Thames. A conſiderable part of the town was burnt by Benedict Arnold in 1781. It has ſince been rebuilt. Here are two places of public worſhip, one for Epiſcopalians, and one for Congregationaliſts, about 300 dwelling houſes, and 4,600 inhabitants. The harbour is large, ſafe and commodious, and has 5 fathoms water; high water at full and change, 54 minutes after 8. On the W. ſide of the entrance is a light houſe, on a point of land which projects conſiderably into the Sound. The exports for a year ending September 30th, 1794, amounted to 557,453 dollars. In that year 1000 mules were ſhipped for the Weſt Indies. It is 14 miles ſouth of Norwich, 54 S. E. by S. of Hartford, 54 E. of New Haven, and 237 N. E. by E. of Philadelphia. N. lat. 41 25, W. long. 72 15. The townſhip of New London was laid out in lots in 1648, but had a few Engliſh inhabitants two years before. It was called by the Indians *Nameag* or *Towawog*, and from being the ſeat of the Pequot tribe, was called *Pequot*. It was the ſeat of *Saſſacus*, the grand monarch of Long-Iſland, and part of Connecticut and Narraganſet.—*ib.*

NEW LONDON, a ſmall townſhip in Hillſborough county, New Hampſhire, incorporated in 1779, and contains 311 inhabitants. It lies at the head of Black-water river, and about 3 miles from the N. E. ſide of Sunapee Lake.—*ib.*

NEW LONDON, a poſt town of Virginia, and the chief town of Bedford county. It ſtands upon riſing ground, and contains about 130 houſes, a court houſe and goal. There were here in the late war ſeveral work-ſhops for repairing fire arms. It is 133 miles W. by S. of Richmond, 152 weſt of Peterſburg, and 393 S. W. by W. of Philadelphia.—*ib.*

NEW MADRID, in the northern part of Louiſiana, is a ſettlement on the W. bank of the Miſſiſippi, commenced ſome years ago, and conducted by Col. Morgan of New Jerſey, under the patronage of the Spaniſh king. The ſpot on which the city was propoſed to be built is ſituated in lat. 36 30 N. and 45 miles below the mouth of Ohio river. The limits of the new city of Madrid were to extend 4 miles S. and 2 W. from the river; ſo as to croſs a beautiful, living deep lake, of the pureſt ſpring water, 100 yards wide, and ſeveral miles in length, emptying itſelf, by a conſtant and rapid narrow ſtream, through the centre of the city. The banks of this lake, called St. Annis, are high, beautiful and pleaſant; the water deep, clear and ſweet, and well ſtored with fiſh; the bottom a clear ſand, free from woods, ſhrubs, or other vegetables. On each ſide of this delightful lake, ſtreets were to be laid out, 100 feet wide, and a road to be continued round it, of the ſame breadth; and the ſtreets were directed to be preſerved forever, for the health and pleaſure of the citizens. A ſtreet 120 feet wide, on the bank of the Miſſiſſippi, was laid out; and the trees were directed to be preſerved for the ſame purpoſe. Twelve acres, in a central part of the city were to be preſerved in like manner, to be ornamented, regulated, and improved by the magiſtracy of the city for public walks; and 40 half-acre lots for other public uſes; and one lot of 12 acres for the king's uſe. We do not hear that this ſcheme is proſecuting, and conclude it is given up. The country in the vicinity of this intended city is repreſented as excellent, and, in many parts, beyond deſcription. The natural growth conſiſts of mulberry, locuſt, ſaſſafras, walnut, hickory, oak, aſh, dog-wood, &c. with one or more grape-vines running up almoſt every tree; and the grapes yield, from experiments, good red wine in plenty, and with little labour. In ſome of the low-grounds grow large cypreſs trees. The climate is ſaid to be favourable to health, and to the culture of fruits of various kinds, particularly for garden vegetables. The praires or meadows are fertile in graſs, flowering-plants, ſtrawberries, and when cultivated produce good crops of wheat, barley, Indian corn, flax, hemp, and tobacco, and are eaſily tilled. Iron and lead mines and ſalt-ſprings, it is aſſerted, are found in ſuch plenty as to afford an abundant ſupply of theſe neceſſary articles. The banks of the Miſſiſſippi, for many leagues in extent, commencing about 20 miles above the mouth of the Ohio, are a continued chain of lime-ſtone. A fine tract of high, rich, level land, S. W. W. and N. W. of New-Madrid, about 25 miles wide, extends quite to the river St Francis.—*ib.*

NEWMANSTOWN, Pennſylvania, ſituated in Dauphin county, on the eaſt ſide of Mill Creek. It contains about 30 houſes, and is 14 miles E. by N. of Harriſburg, and 72 N. W. by W. of Philadelphia.—*ib.*

NEWMARKET, a townſhip in Rockingham county, New Hampſhire, north of Exeter, of which it was formerly a part, and 13 miles weſt of Portſmouth. It was incorporated in 1727, and contains 1137 inhabitants. Foſſil ſhells have been found near Lamprey river in this town, at the depth of 17 feet; and in ſuch a ſituation as that the bed of the river could never have been there. The ſhells were of oyſters, muſcles, and clams intermixed.—*ib.*

NEWMARKET, a village in Frederick county, Maryland, on the high road to Frederickſtown, from which it lies nearly 13 miles W. S. W. and about 36 north-weſt of the Federal City.—*ib.*

NEWMARKET, a village in Dorcheſter county, Maryland, 3 miles north-eaſt of Indian-Town, on Choptank river, 9 north-eaſt of Cambridge, and as far north-weſt of Vienna.—*ib.*

NEWMARKET, a town in Virginia, Amherſt county, on the north ſide of James river, at the mouth of Tye river. It is a ſmall place, contains a tobacco warehouſe; is 100 miles above Richmond, and 378 from Philadelphia.—*ib.*

NEW MARLBOROUGH, a townſhip in Ulſter county, New-York.—*ib.*

NEW MARLBOROUGH, Berkſhire county, Maſſachuſetts. It is 23 miles ſouthward of Lenox, and 144 S. W. by W. of Boſton.—*ib.*

NEW MARLBOROUGH, a town in King George's county, Virginia, on the weſt ſide of Patowmac river, 10 miles eaſt of Falmouth.—*ib.*

NEW MEADOWS *River*, in the Diſtrict of Maine, a water of Caſco Bay, navigable for veſſels of a conſiderable burden a ſmall diſtance.—*ib.*

NEW MILFORD, a poſt town of Connecticut, Litchfield county, on the eaſtern ſide of Houſatonick river, about 16 miles north of Danbury, 20 ſouth-weſt of Litchfield, and 52 W. by S. W. of Hartford.—*ib.*

NEW ORLEANS, the metropolis of Louiſiana, was regularly laid out by the French in the year 1720, on the eaſt ſide of the river Miſſiſſippi, in lat. 30 2 north, and long. 89 53 weſt; 18 miles from Detour des Anglois, or Engliſh Turn, and 105 miles from the Balize at the mouth of the river. All the ſtreets are perfectly ſtraight but too narrow, and croſs each other at right angles. There were, in 1788, 1,100 houſes in this town, generally built with timber frames, raiſed about 8 feet from the ground, with large galleries round them, and the cellars under the floors level with the ground; any ſubterraneous buildings would be conſtantly full of water. Moſt of the houſes have gardens. In March, 1788, this town, by a fire, was reduced in five hours to 200 houſes. It has ſince been rebuilt. The ſide next the river is open, and is ſecured from the inundations of the river, by a raiſed bank, generally called the levee, which extends from the Engliſh Turn, to the upper ſettlements of the Germans, a diſtance of more than 50 miles, with a good road all the way. There is reaſon to believe that in a ſhort time New-Orleans may become a great and opulent city, if we conſider the advantages of its ſituation, but a few leagues from the ſea, on a noble river, in a moſt fertile country, under a moſt delightful and wholeſome climate, within 2 weeks ſail of Mexico, and ſtill nearer the French, Spaniſh, and Britiſh Weſt-India iſlands, with a moral certainty of its becoming a general receptacle for the produce of that extenſive and valuable country on the Miſſiſſippi, Ohio, and its other branches; all which are much more than ſufficient to enſure the future wealth, power, and proſperity of this city. The veſſels which ſail up the Miſſiſſippi haul cloſe along ſide the bank next to New Orleans, to which they make faſt, and take in or diſcharge their cargoes with the ſame eaſe as at a wharf.—*ib.*

NEW PALTZ, a townſhip in Ulſter county, New York, bounded eaſterly by Hudſon river, ſoutherly by Marlborough and Shawangunk. It contains 2,309 inhabitants, including 302 ſlaves. The compact part of it is ſituated on the eaſtern ſide of Wall Kill, and contains about 250 houſes and a Dutch church. It is 10 miles from Shawangunk, 14 ſoutherly of Kingſton, 20 ſouth-weſt of Rhinebeck, and 80 north-north-weſt of New York.—*ib.*

NEWPORT, a townſhip of Nova Scotia, in Hants county, on the river Avon. The road from Halifax runs part of the way between this townſhip and Windſor; and has ſettlements on it at certain diſtances.—*ib.*

NEWPORT, a townſhip in Cheſhire county, New

Hampſhire, eaſt of Claremont. It was incorporated in 1761, and contains 780 inhabitants.—*ib.*

Newport, a maritime county of the ſtate of Rhode-Iſland, comprehending Rhode-Iſland, Cannonicut, Block, Prudence, and ſeveral other ſmall iſlands. It is divided into 7 townſhips, and contains 14,300 inhabitants, including 366 ſlaves.—*ib.*

Newport, the chief town of this county, and the ſemi-metropolis of the ſtate of Rhode Iſland; ſtands on the ſouth-weſt end of Rhode Iſland, about 5 miles from the ſea. Its harbour, (which is one of the fineſt in the world) ſpreads weſtward before the town. The entrance is eaſy and ſafe, and a large fleet may anchor in it and ride in perfect ſecurity. It is probable this may, in ſome future period, become one of the man-of-war ports of the American empire. The town lies north and ſouth upon a gradual aſcent as you proceed eaſtward from the water, and exhibits a beautiful view from the harbour, and from the neighbouring hills which lie weſtward upon the main. Weſt of the town is Goat-Iſland, on which is Fort Waſhington. It has been lately repaired and a citadel erected in it. The fort has been ceded to the United States. Between Goat-Iſland and Rhode Iſland is the harbour. Newport contains about 1,000 houſes, built chiefly of wood. It has 10 houſes for public worſhip, 4 for Baptiſts, 2 for Congregationaliſts, one for Epiſcopalians, one for Quakers, one for Moravians, and one for Jews. The other public buildings are a ſtate houſe, and an edifice for the public library. The ſituation, form and architecture of the ſtate houſe, give it a pleaſing appearance. It ſtands ſufficiently elevated, and a long wharf and paved parade lead up to it from the harbour. Front or Water ſtreet is a mile in length. Here is a flouriſhing academy, under the direction of a rector, and tutors, who teach the learned languages, Engliſh grammar, geography, &c. A marine ſociety was eſtabliſhed here in 1752, for the relief of diſtreſſed widows and orphans, and ſuch of their ſociety as may need relief. This city, far famed for the beauty of its ſituation and the ſalubrity of its climate, is no leſs remarkable for the great variety and excellent quality of freſh fiſh which the market furniſhes at all ſeaſons of the year. No leſs than ſixty different kinds have been produced in this market. The excellent accommodations and regulations of the numerous packets, which belong to this port, and which ply thence to Providence and New-York, are worthy of notice. They are ſaid, by European travellers, to be ſuperior to any thing of the kind in Europe. This town, although greatly injured by the late war, and its conſequences, has a conſiderable trade. A cotton and duck manufactory have been lately eſtabliſhed. The exports for a year, ending Sept. 30, 1794, amounted to 311,200 dollars. It was firſt ſettled by Mr William Coddington, afterwards governor, and the father of Rhode Iſland, with 17 others, in 1639. It is 30 miles S. by E. of Providence, 14 ſouth eaſt of Briſtol, 75 S. W. by S. of Boſton, 113 E. N. E. of New Haven, and 292 N. E. by E. of Philadelphia. N. lat. 41 29, W. long. from Greenwich 71 17.—*ib.*

Newport, a ſmall poſt town in Newcaſtle county, Delaware; ſituated on the north ſide of Chriſtiana Creek, three miles W. of Wilmington. It contains about 200 inhabitants, and carries on a conſiderable trade with Philadelphia, in flour. It is 6 miles N. E. by N. of Chriſtiana Bridge, and 31 S. W. of Philadelphia.—*ib.*

Newport, a townſhip in Luzerne county, Pennſylvania.—*ib.*

Newport, a ſmall poſt-town in Charles county, Maryland, 11 miles S. E. of Port Tobacco, 94 S. by W. of Baltimore, and 195 ſouth-weſt of Philadelphia.—*ib.*

Newport, a very thriving ſettlement in Liberty county, Georgia, ſituated on a navigable creek, 34 miles ſouth of Savannah, and 7 or 8 ſouth of weſt from Sunbury. This place, commonly known by the name of *Newport Bridge*, is the rival of Sunbury, and commands the principal part of the trade of the whole county. A poſt-office is kept here.—*ib.*

NEW RIVER, a river of Tenneſſee, which riſes on the north ſide of the Alleghany mountains, and running a north-eaſt courſe enters Virginia, and is called Kanhaway.—*ib.*

NEW ROCHELLE, a townſhip in Weſt-Cheſter county, New-York, on Long-Iſland Sound. It contained 692 inhabitants, of whom 89 were ſlaves, in 1790. In 1796, there were 100 of the inhabitants qualified electors. It is 6 miles S. W. of Rye, and 20 north-eaſterly of New York city.—*ib.*

NEW SALEM, or *Pequottink*, a Moravian ſettlement, formed in 1786, on the E. ſide of Huron river, which runs northward into Lake Erie.—*ib.*

New Salem, a townſhip in Hampſhire county, Maſſachuſetts, bounded E. by the weſt line of Worceſter county. It was incorporated in 1753, and contains 1543 inhabitants. It is 85 miles W. by N. of Boſton.—*ib.*

New Salem, a townſhip in Rockingham county, New Hampſhire, adjoining Pelham and Haverhill.—*ib.*

NEW-SAVANNAH, a village in Burke county, Georgia, on the S. W. bank of the Savannah, 12 miles S. E. of Auguſta.—*ib.*

NEW-SMYRNA *Entrance*, or *Moſkito Inlet*, on the coaſt of Florida, is about 11 leagues north-north-weſt ¼ weſt from Cape Canaverel.—*ib.*

NEW-SWEDELAND was the name of the territory between Virginia and New-York, when in poſſeſſion of the Swedes, and was afterwards poſſeſſed, or rather claimed by the Dutch. The chief town was called *Gottenburg.*—*ib.*

NEWTON (John), an eminent Engliſh mathematician was born at Oundle in Northamptonſhire, 1622. After a proper foundation at ſchool, he was ſent to Oxford, where he was entered a commoner of St Edmund's Hall in 1637. He took the degree of bachelor of arts in 1641; and the year following was created maſter, among ſeveral gentlemen that belonged to the king and court, then reſiding in the univerſity. At which time, his genius being inclined to aſtronomy and the mathematics, he applied himſelf diligently to thoſe ſciences, and made a great proficiency in them, which he found of ſervice during the times of the uſurpation. After the reſtoration of Charles II. he reaped the fruits of his loyalty; being created doctor of divinity at Oxford Sept. 1661, he was made one of the king's chaplains, and rector of Roſs in Herefordſhire, in the place of Mr John Toombes, ejected for nonconformity. He held this living till his death, which happened at Roſs on Chriſtmas-day 1678. Mr Wood gives him the character of a capricious and humourſome perſon: however that may be, his writings are ſufficient monuments of his genius and ſkill in the mathematics. Theſe are,

1. *Aſtronomia Britannica,* &c. in three parts, 1656, in 4to. 2. Help to Calculation; with Tables of Declination, Aſcenſion, &c. 1657, 4to. 3. *Trigonometria Britannica,* in two books, 1658, folio; one compoſed by our author, and the other tranſlated from the Latin of Henry Gellibrand. 4. *Chiliades centum Logarithmorum,* printed with, 5. Geometrical Trigonometry, 1659. 6. Mathematical Elements, three parts, 1660, 4to. 7. A perpetual Diary or Almanac, 1662. 8. Deſcription of the Uſe of the Carpenter's Rule, 1667. 9. Ephemerides, ſhewing the Intereſt and rate of Money at 6 *per cent,* &c. 1667. 10. *Chiliades centum Logarithmorum, et Tabula Partium proportionalium,* 1667. 11. The Rule of Intereſt, or the Caſe of Decimal Fractions, &c. Part II. 1668, 8vo. 12. School-Paſtime for young Children, &c. 1669, 8vo. 13. Art of practical Gauging, &c. 1669. 14. Introduction to the Art of Rhetoric, 1671. 15. The Art of Natural Arithmetic, in whole Numbers, and Fractions Vulgar and Decimal, 1671, 8vo. 16. The Engliſh Academy, 1677, 8vo. 17. Coſmography. 18. Introduction to Aſtronomy. 19. Introduction to Geography, 1678, 8vo.*

NEWTON, a pleaſant townſhip in Middleſex county, Maſſachuſetts, ſituated on Charles river, and is 9 miles weſt of Boſton. It was incorporated in 1691, and contains 1360 inhabitants.—*Morſe.*

Newton, a ſmall town in Cheſter county, Pennſylvania, 22 miles ſouth of Philadelphia.—*ib.*

Newton, a townſhip in Rockingham county, New Hampſhire, on Powow river, adjoining Ameſbury, in Maſſachuſetts, 10 or 12 miles ſoutherly of Exeter. It was incorporated in 1749, and contains 530 inhabitants.—*ib.*

NEWTOWN, a poſt-town in Fairfield county, Connecticut, 9 miles eaſt-north-eaſt of Danbury, 26 weſt-north-weſt of New-Haven, 61 ſouth-weſt of Hartford, and 80 north-eaſt of New-York. The town ſtands pleaſantly on an elevated ſpot, and was ſettled in 1708. —*ib.*

Newtown, on Staten-Iſland, New-York, is 3 miles N. E. of Old-Town, as far eaſt of Richmond, and 9 ſouth-weſterly of New-York.—*ib.*

Newtown, a townſhip in Queen's county, New-York, includes all the iſlands in the Sound oppoſite the ſame. It is about 8 miles eaſt of New-York, and contains 2,111 inhabitants, including 533 ſlaves.—*ib.*

Newtown, a townſhip in Weſt Cheſter county, New-York; of whoſe inhabitants 276 are electors.—*ib.*

Newtown, a townſhip in Tioga county, New-York, lies between the ſouth end of Seneca lake and Tioga river; having Chemung townſhip eaſt, from which it was taken and incorporated in 1792. In 1796, 169 of its inhabitants were electors.—*ib.*

Newtown, a townſhip in Glouceſter county, New Jerſey.—*ib.*

Newtown, the ſeat of juſtice in Suſſex county, New Jerſey, is about 10 miles S. E. of Sandyſton.—*ib.*

Newtown, the capital of Bucks county, Pennſylvania. It contains a preſbyterian church, a ſtone jail, a court-houſe, an academy, and about 50 houſes. It was ſettled in 1725, and is 10 miles W. of Trenton, in New Jerſey, and 30 N. E. by N. of Philadelphia.—There are two other townſhips of this name, the one in Delaware county, the other in that of Cumberland.—*ib.*

Newtown, a ſmall town of Virginia, ſituated in Frederick county, between the north and ſouth branches of Shenandoah river; 7 miles ſouth of Wincheſter, and 173 north-north-weſt of Richmond.—*ib.*

NEW-UTRECHT, a ſmall maritime town of New-York, ſituated in King's county, Long-Iſland, oppoſite the Narrows, and 7 miles ſouth of New-York city. The whole townſhip contains 562 inhabitants; of whom 76 are qualified electors, and 206 ſlaves.—*ib.*

NEW-WINDSOR, a townſhip of Ulſter county, New-York, pleaſantly ſituated on the W. bank of Hudſon river, juſt above the high lands, 3 miles ſouth of Newburgh, and 6 north of Weſt Point. It contains 1819 inhabitants; of whom 261 are qualified electors, and 117 ſlaves. A valuable ſet of works in this town for manufacturing ſcythes were deſtroyed by fire. In 1795, the legiſlature granted the unfortunate proprietor, Mr. Boyd, £1500 to enable him to re-eſtabliſh them. The compact part of the town contains about 40 houſes and a preſbyterian church, 64 miles north of New-York. The ſummer reſidence of governor Clinton was formerly at a rural ſeat, on the margin of the river, at this place.—*ib.*

NEW-WRENTHAM, diſtrict of Maine, a townſhip 6 miles E. of Penobſcot river, adjoining Orrington, and 15 miles from Buckſton.—*ib.*

NEW-YEAR's *Harbour,* on the north coaſt of Staten Land Iſland, at the ſouth extremity of South America, affords wood and good water; was diſcovered Jan. 1, 1775; hence its name. S. lat. 54 49, weſt long. 64 11.—*ib.*

New-Year's *Iſlands,* near the above harbour, within which is anchorage at north half weſt from the harbour, at the diſtance of two leagues from it.—*ib.*

NEW-YORK, one of the United States of America, is ſituated between lat. 40 40 and 45 north, and between long. 73 10 and 80 weſt; is about 350 miles in length, and 300 in breadth; bounded ſouth-eaſterly by the Atlantic ocean; eaſt by Connecticut, Maſſachuſetts, and Vermont; north by Upper Canada; ſouth-weſt and weſt by Pennſylvania, New Jerſey, and Lake Erie. It is ſubdivided into 21 counties as follows, viz. New-York, Richmond, Suffolk, Weſt Cheſter, Queen's, King's, Orange, Ulſter, Dutcheſs, Columbia, Renſſelaer, Waſhington, Clinton, Saratoga, Albany, Montgomery, Herkemer, Onondago, Otſego, Ontario, and Tioga. In 1790, this ſtate contained 340,120 inhabitants; of whom 21,324 were ſlaves. Since that period the counties of Renſſelaer, Saratoga, Herkemer, Onondago, Otſego, and Tioga have been taken from the other counties. In 1796, according to the ſtate cenſus, there were 195 townſhips, and 64,017 qualified electors. Electors in this ſtate are divided into the following claſſes:

Freeholders to the value of £1000	36,338
Do. to the value of £20 and under £100	4,838
Do. who rent tenements of 40ſ. per annum	22,598
Other freeholders	243
	64,017

It is difficult to aſcertain accurately the proportion the number of electors bears to the whole number of inhabitants in the ſtate. In the county of Herkemer, the electors to the whole number of inhabitants was, in 1795, nearly as 1 to 6, but this proportion will not hold through the ſtate. In 1790, the number of inhabitants in the ſtate was, as already mentioned, 340,120, of whom 41,785 were electors. In 1795, the number of electors was 64,017, which, if the proportion between the electors and the whole number of inhabitants be the ſame, gives, as the whole number of inhabitants in 1795, 530,177, an increaſe, in 5 years, of 190,057.

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* Biog. Dict. new edit.

The chief rivers are Hudſon, Mohawk, and their branches. The rivers Delaware and Suſquehannah riſe in this ſtate. The principal lakes are Otſego, Oneida, George, Seneca, Cayuga, Salt, and Chautaughque. The principal bay is that of York, which ſpreads to the ſouthward before the city of New-York.

The legiſlature of New-York, ſtimulated by the enterprizing and active Pennſylvanians, who are competitors for the trade of the weſtern country, have lately granted very liberal ſums, towards improving thoſe roads that traverſe the moſt ſettled parts of the country, and opening ſuch as lead into the weſtern and northern parts of the ſtate, uniting, as far as poſſible, the eſtabliſhments on Hudſon's river, and the moſt populous parts of the interior country, by the neareſt practicable diſtances. By late eſtabliſhments of poſt-roads, a ſafe and direct conveyance is opened between the moſt interior weſtern parts of this ſtate, and the ſeveral ſtates in the Union: and when the obſtructions between Hudſon's river and lake Ontario are removed, there will not be a great deal to do to continue the water communication by the lakes, and through Illinois river to the Miſſiſſipi. New-York, to ſpeak generally, is interſected by ridges of mountains, extending in a N. E. and S. W. direction. Beyond the Alleghany mountains, however, the country is level, of a fine rich ſoil, covered in its natural ſtate with maple, beech, birch, cherry, black walnut, locuſt, hickory, and ſome mulberry trees. On the banks of Lake Erie are a few cheſnut and oak ridges. Hemlock ſwamps are interſperſed thinly through the country. All the creeks that empty into Lake Erie have falls, which afford many excellent mill-ſeats. The lands between the Seneca and Cayuga lakes, are repreſented as uncommonly excellent, being moſt agreeably diverſified with gentle riſings, and timbered with lofty trees, with little underwood. The legiſlature have granted a million and a half acres of land, as a gratuity to the officers and ſoldiers of the line of this ſtate. This tract forms the military townſhips of the county of Onondago. Eaſt of the Alleghany mountains, which commence with the Kaat's Kill, on the weſt ſide of Hudſon's river, the country is broken into hills with rich intervening vallies. The hills are cloathed thick with timber, and when cleared afford fine paſture; the vallies, when cultivated, produce wheat, hemp, flax, peas, graſs, oats, Indian corn, &c. Of the commodities produced from culture, wheat is the principal. Indian corn and peas are likewiſe raiſed for exportation; and rye, oats, barley, &c. for home conſumption. The beſt lands in the ſtate, along the Mohawk river and north of it, and weſt of the Alleghany mountains, but a few years ago was moſtly in a ſtate of nature, but has been of late rapidly ſettling. In the northern and unſettled parts of the ſtate, are plenty of mooſe, deer, bears, ſome beavers, martins, and moſt other inhabitants of the foreſt, except wolves. The Ballſtown, Saratoga, and New-Lebanon medicinal ſprings are much celebrated. The ſalt made from the Salt Springs here is equal in goodneſs to that imported from Turk's Iſland. The weight of a buſhel of the ſalt is 136 lb. A ſpring is reported to have been diſcovered in the Suſquehannah country, impregnated with nitre, from which ſalt-petre is made in the ſame manner that common ſalt is made from the Onondago ſprings. Large quantities of iron ore are found here. A ſilver mine has been worked at Phillipſburg, which produced virgin ſilver. Lead is found in Herkemer county, and ſulphur in Montgomery. Spar, zink or ſpelter, a ſemi-metal, magnez, uſed in glazings, pyrites of a golden hue, various kinds of copper ore, and lead and coal mines are found in this ſtate, alſo petrified wood, plaſter of Paris, iſinglaſs in ſheets, talcs, and cryſtals of various kinds and colours, flint, aſbeſtos, and ſeveral other foſſils. A ſmall black ſtone has alſo been found, which vitrifies with a ſmall heat, and it is ſaid makes excellent glaſs. The chief manufactures are iron, glaſs, paper, pot and pearl aſhes, earthen ware, maple ſugar and molaſſes, and the citizens in general manufacture their own clothing. This ſtate, having a ſhort and eaſy acceſs to the ocean, commands the trade of a great proportion of the beſt ſettled and beſt cultivated parts of the United States. Their exports to the Weſt-Indies are biſcuit, peas, Indian corn, apples, onions, boards, ſtaves, horſes, ſheep, butter, cheeſe, pickled oyſters, beef and pork. But wheat is the ſtaple commodity of the ſtate, of which no leſs than 677,700 buſhels were exported ſo long ago as the year 1775, beſides 2,555 tons of bread, and 2,828 tons of flour. The increaſe ſince has been in proportion to the increaſe of the population. In wheat and flour about a million buſhels are now annually exported. Weſt-India goods are received in return for the above articles. Beſides the articles already enumerated, are exported flax-ſeed, cotton wool, ſarſaparilla, coffee, indigo, rice, pig-iron, bar-iron, pot-aſh, pearl-aſh, furs, deer-ſkins, logwood, fuſtic, mahogany, bees-wax, oil, Madeira wine, rum, tar, pitch, turpentine, whale-fins, fiſh, ſugars, molaſſes, ſalt, tobacco, lard, &c. but moſt of theſe articles are imported for re-exportation. The exports to foreign parts, for the year ending September 30, 1791, 1792, &c. conſiſting principally of the articles above enumerated, amounted as follows; in 1791, to 2,505,465 dolls. 10 cents; 1792—2,535,790 dolls. 25 cents; 1793—2,932,370 dolls.; 1794—5,442,183 dolls. 10 cents; 1795—10,304,580 dolls. 78 cents. This ſtate owned in 1792, 46,626 tons of ſhipping, beſides which ſhe finds employment for about 40,000 tons of foreign veſſels. There are in this ſtate, two handſomely endowed and flouriſhing colleges, viz. Columbia, formerly King's College, in the city of New-York, and Union College, at Schenectady. Beſides theſe, there are diſperſed in different parts of the ſtate, 14 incorporated academies, containing in the whole as many as 6 or 700 ſtudents. Theſe, with the eſtabliſhment of ſchools, one at leaſt in every diſtrict of 4 ſquare miles, for the common branches of education, muſt have the moſt beneficial effects on the ſtate of ſociety. The ſums granted by the legiſlature of this ſtate for the encouragement of literature ſince the year 1790, have been very liberal, and is evincive of the wiſeſt policy. In March, 1790, the legiſlature granted to the regents of the univerſity, who have by law the ſuperintendance and management of the literature of the ſtate, ſeveral large and valuable tracts of land, on the waters of Lakes George and Champlain, and alſo Governor's Iſland in the harbour of New-York, with intent that the rents and income thereof ſhould be by them applied to the advancement of literature. At the ſame time they granted them £1000 currency, for the ſame general purpoſe. In April, 1792, they ordered to be paid to the regents £1500 for enlarging the library, £200 for a chemical apparatus, £1200 for erecting a wall to ſupport the college grounds, and £5000 for erecting a hall and an additional wing to the college: Alſo £1500 annually for 5 years, to be diſcretionally diſtributed among the academies of the ſtate. Alſo £750, for 5 years, to be applied to the payment of the ſalaries of additional profeſſors. In their ſeſſions ſince 1795, the ſums they have granted for the ſupport of the colleges, academies, and of common ſchools throughout the ſtate, have been very liberal. The religious ſects or denominations in this ſtate are, Engliſh Preſbyterians, Dutch reformed, Baptiſts, Epiſcopalians, Friends or Quakers, German Lutherans, Moravians, Methodiſts, Roman Catholics, Shakers, a few followers of Jemima Wilkinſon at Geneva, and ſome Jews in the city of New-York. The treaſury of this ſtate is one of the richeſt in the Union. The treaſurer of the ſtate reported to the legiſlature in Jan. 1796, that the funds amounted to 2,119,068 dollars, 33 cents, which yields an annuity of 234,218 dollars. Beſides the above immenſe ſum, there was at that period in the treaſury £134,207 : 19 : 10½ currency. The ability of the ſtate, therefore, is abundantly competent to aid public inſtitutions of every kind, to make roads, erect bridges, open canals, and puſh every kind of improvement to the moſt deſirable length. The body of the Six Nations of Indians inhabit the weſtern part of this ſtate.

The Engliſh language is generally ſpoken throughout the ſtate, but is not a little corrupted by the Dutch dialect, which is ſtill ſpoken in ſome counties, particularly in King's, Ulſter, Albany, and that part of Orange which lies S. of the mountains. But as Dutch ſchools are almoſt, if not wholly diſcontinued, that language, in a few generations, will probably ceaſe to be uſed at all. And the increaſe of Engliſh ſchools has already had a perceptible effect in the improvement of the Engliſh language. Beſides the Dutch and Engliſh, there are in this ſtate many emigrants from Scotland, Ireland, Germany, and ſome few from France. Many Germans are ſettled on the Mohawk, and ſome Scots people on the Hudſon, in the county of Waſhington. The principal part of the two former ſettled in the city of New-York, and retain the manners, the religion, and ſome of them the language of their reſpective countries. The French emigrants ſettled principally at New-Rochelle, and on Staten-Iſland, and their deſcendants, ſeveral of them, now fill ſome of the higheſt offices in the United States. The weſtern parts of the ſtate are ſettled and ſettling principally from New-England. There are three incorporated cities in this ſtate, New-York, Albany, and Hudſon.—*ib.*

NEW-YORK *County*, in the above ſtate, comprehending the iſland of New-York, or Manhattan, on which the metropolis ſtands, and the following ſmall iſlands: Great Barn, Little Barn, Manning's, Nutten, Bedlow's, Bucking, and Oyſter Iſlands. It contained, in 1790, 33,131 inhabitants, including 2369 ſlaves. Now, in 1796, the number of inhabitants amounts to about 70,000, of whom 7,272 are qualified electors.—*ib.*

NEW-YORK *City* is ſituated on the S. W. point of York iſland, at the confluence of Hudſon and Eaſt rivers, and is the metropolis of the ſtate of its name, and the ſecond in rank in the Union. The length of the city on Eaſt river is upwards of two miles, and rapidly increaſing, but falls ſhort of that diſtance on the banks of the Hudſon. Its breadth, on an average, is about a mile; and its circumference, 4 or 5 miles. The plan of the city is not perfectly regular, but is laid out with reference to the ſituation of the ground. The ground which was unoccupied before the peace of 1783, was laid out in parallel ſtreets of convenient width, which has had a good effect upon the parts of the city lately built. The principal ſtreets run nearly parallel with the rivers. Theſe are interſected, though not at right angles, by ſtreets running from river to river. In the width of the ſtreets there is a great diverſity. Water-ſtreet and Pearl-ſtreet, which occupy the banks of Eaſt river, are very conveniently ſituated for buſineſs, but they are low and too narrow; not admitting in ſome places of walks on the ſides for foot paſſengers. Broad-ſtreet, extending from the Exchange to City Hall, is ſufficiently wide. This was originally built on each ſide of the creek, which penetrated almoſt to the City Hall. This ſtreet is low, but pleaſant. But the moſt convenient and agreeable part of the city is the Broadway. It begins at a point which is formed by the junction of the Hudſon and Eaſt rivers—occupies the height of land between them, upon a true meridional line—riſes gently to the northward—is nearly 70 feet wide—adorned, where the fort formerly ſtood, (which has lately been levelled) with an elegant brick edifice, for the accommodation of the governor of the ſtate, and a public walk from the extremity of the point, occupying the ground of the lower battery which is now demoliſhed; alſo with two Epiſcopal churches, and a number of elegant private buildings. It terminates, to the northward, in a triangular area, fronting the bridewell and alms-houſe, and commands from any point, a view of the Bay and Narrows. Since the year 1788, that part of the city, which was buried in ruins during the war, has been rapidly rebuilding, the ſtreets widened, ſtraitened, raiſed in the middle under an angle ſufficient to carry off the water to the ſide gutters, and foot-ways of brick made on each ſide. At this time, the part that was deſtroyed by fire is all covered with elegant brick houſes. Wall-ſtreet is generally 50 feet wide and elevated, and the buildings elegant. Hanover-ſquare and Dock-ſtreet are conveniently ſituated for buſineſs, and the houſes well built. William-ſtreet is alſo elevated and convenient, and is the principal market for retailing dry goods. Many of the other ſtreets are pleaſant, but moſt of them are irregular and narrow. The houſes are generally built of brick, and the roofs tiled. There are remaining a few houſes built after the old Dutch manner; but the Engliſh taſte has prevailed almoſt a century. The moſt magnificent edifice in this city is *Federal Hall*, ſituated at the head of Broad-ſtreet, where its front appears to great advantage, in which is a gallery 12 feet deep, guarded by an elegant iron railing. In this gallery our beloved WASHINGTON, attended by the ſenate and houſe of repreſentatives, took his oath of office in the face of Heaven, and in preſence of a large concourſe of people aſſembled in front, at the commencement of the operation of the Federal conſtitution, April 30th, 1789. The other public buildings in the city are, three houſes for public

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worſhip for the Dutch Reformed church, four Preſbyterian churches, three Epiſcopal churches, two for German Lutherans and Calviniſts, two Friends' meeting-houſes, two for Baptiſts, two for Methodiſts, one for Moravians, one Roman Catholic church, one French Proteſtant church, and a Jew's ſynagogue. Beſides theſe there is the governor's houſe, already mentioned, a handſome building, the college, jail, and ſeveral other buildings of leſs note. The city is accommodated with four markets in different parts, which are furniſhed with a great plenty and variety of proviſions, in neat and excellent order.

King's college, in the city of New-York, was principally founded by the voluntary contributions of the inhabitants of the province, aſſiſted by the general aſſembly, and the corporation of Trinity Church; in the year 1754, a royal charter (and grant of money) being then obtained, incorporating a number of gentlemen therein mentioned, by the name of "The Governors of the College of the province of New-York, in the city of New-York, in America;" and granting to them and their ſucceſſors forever, amongſt various other rights and priveleges, the power of conferring all ſuch degrees as are uſually conferred by either of the Engliſh univerſities. By the charter it was provided that the preſident ſhall always be a member of the church of England, and that a form of prayer collected from the liturgy of that church, with a particular prayer for the college, ſhall be daily uſed, morning and evening, in the college chapel; at the ſame time, no teſt of their religious perſuaſion was required from any of the fellows, profeſſors or tutors; and the advantages of education were equally extended to ſtudents of all denominations. The building (which is only one third of the intended ſtructure) conſiſts of an elegant ſtone edifice, three complete ſtories high, with four ſtaircaſes, 12 apartments in each, a chapel, hall, library, muſeum, anatomical theatre, and a ſchool for experimental philoſophy. The college is ſituated on a dry gravelly ſoil, about 150 yards from the bank of Hudſon's river, which it overlooks, commanding a moſt extenſive and beautiful proſpect. Since the revolution, the legiſlature paſſed an act conſtituting 21 gentlemen (of whom the governor and lieutenant-governor, for the time being, are members *ex officiis*) a body corporate and politic, by the name and ſtyle of "The Regents of the Univerſity of the State of New-York." They are entruſted with the care of literature in general in the ſtate, and have power to grant charters of incorporation for erecting colleges and academies throughout the ſtate, are to viſit theſe inſtitutions as often as they ſhall think proper, and report their ſtate to the legiſlature once a year. King's College, which we have already deſcribed, is now called *Columbia College*. This college, by an act of the legiſlature paſſed in the ſpring of 1787, was put under the care of 24 gentlemen, who are a body corporate by the name and ſtyle of "The Truſtees of Columbia College in the city of New-York." This body poſſeſs all the powers veſted in the governors of King's College, before the revolution, or in the regents of the univerſity, ſince the revolution, ſo far as their power reſpected this inſtitution. No regent can be a truſtee of any particular college or academy in the ſtate. The regents of the univerſity have power to confer the higher degrees, and them only. The college edifice has received no addition ſince the peace, though the erection of a hall and a wing have been contemplated, and funds for the purpoſe granted by the legiſlature. The annual revenue ariſing from the eſtate belonging to the college, excluſive of ſome bonds, which are not at preſent productive, amounts to £1,535 currency. Columbia college conſiſts of two faculties; a faculty of arts and a faculty of phyſic. The firſt has a preſident and 7 profeſſors, and the ſecond a dean and 7 profeſſors. The ſtudents attending both the faculties at the beginning of the year 1795 amounted to 140. The officers of inſtruction and immediate government in the faculty of arts, are a preſident, profeſſor of mathematics and natural philoſophy, a profeſſor of logic and geography, and a profeſſor of languages. To theſe have lately been added a profeſſor of chymiſtry and agriculture, a profeſſor of oriental languages, a profeſſor of law, and a profeſſor of the French language. In the faculty of phyſic, the dean is lecturer on clinical medicine in the New-York hoſpital; and there are the profeſſorſhips of botany, of anatomy, of the obſtetric art, of materia medica, of the inſtitutes of medicine, of ſurgery, and the practice of phyſic. Theſe profeſſors afford the neceſſary inſtruction in the healing art. The library and muſeum were deſtroyed during the war. Upwards of £800 (of monies granted by the legiſlature) have been lately expended in books to increaſe the library. The philoſophical apparatus is new and complete. The government of the city (which was incorporated in 1696) is now in the hands of a mayor, aldermen and common council. The city is divided into ſeven wards, in each of which there is choſen annually by the people an alderman and an aſſiſtant, who, together with the recorder, are appointed annually by the council of appointment. The mayor's court, which is held from time to time by adjournment, is in high reputation as a court of law. A court of ſeſſions is likewiſe held for the trial of criminal cauſes. The ſituation of the city is both healthy and pleaſant. Surrounded on all ſides by water, it is refreſhed with cool breezes in ſummer, and the air in winter is more temperate than in other places under the ſame parallel. This city is eſteemed the moſt eligible ſituation for commerce in the United States. It almoſt neceſſarily commands the trade of one half New Jerſey, moſt of that of Connecticut, part of that of Maſſachuſetts, and almoſt the whole of Vermont, beſides the whole fertile interior country, which is penetrated by one of the largeſt rivers in America. This city imports moſt of the goods conſumed between a line of 30 miles E. of Connecticut river, and 20 miles weſt of the Hudſon, which is 130 miles; and between the ocean and the confines of Canada, about 400 miles; a conſiderable portion of which is the beſt peopled of any part of the United States; and the whole territory contains nearly a million people, or one one-fifth of the inhabitants of the Union. Beſides, ſome of the other ſtates are partially ſupplied with goods from New-York. But in the ſtaple commodity, flour, Pennſylvania and Maryland have exceeded it, the ſuperfine flour of thoſe ſtates commanding a higher price than that of New-York; not that the quality of the grain is worſe, but becauſe greater attention is paid in thoſe ſtates to the inſpection and manufacture of that article. In the manufacture likewiſe of iron, paper, cabinet works, &c.

New York, ‖ Neybe.

Niagara.

Pennſylvania exceeds not only New York, but all her ſiſter States. In times of peace, however, New York will command more commercial buſineſs than any town in the United States. In time of war it will be inſecure, without a marine force; but a ſmall number of ſhips will be able to defend it from the moſt formidable attacks by ſea. A want of good water is a great inconvenience to the citizens, there being few wells in the city. Moſt of the people are ſupplied every day with freſh water, conveyed to their doors in caſks, from a pump near the head of Queen ſtreet, which receives it from a ſpring almoſt a mile from the centre of the city. This well is about 20 feet deep and four feet diameter. The average quantity drawn daily from this remarkable well, is 110 hogſheads of 130 gallons each. In ſome hot ſummer days 216 hogſheads have been drawn from it; and what is very ſingular, there is never more or leſs than about 3 feet water in the well. The water is ſold commonly at three pence a hogſhead at the pump. This inconvenience, however, has of late been removed in a great degree by the introduction of the Manhattan water in pipes to various parts of the city, this, ſo far as it has been carried, is of very great advantage. On a general view of this city, as deſcribed 40 years ago, and in its preſent ſtate, the compariſon is flattering to the preſent age; particularly the improvements in taſte, elegance of manners, and that eaſy unaffected civility and politeneſs which form the happineſs of ſocial intercourſe. The number of inhabitants in the city and county of New-York in 1756, was 10,881; 1771, 21,863; 1786, 23,614; 1790, 33,131; 1796, 7,272 electors; probably about 70,000 inhabitants. There is no baſon for the reception of veſſels, but the road where they lie in Eaſt river, which is protected from the violence of the ſea by the circumjacent iſlands. The great rapidity of the tides in the narrow channels between Long Iſland and York Iſland, and between Long Iſland and Staten Iſland, increaſed by the water of Hudſon and Eaſt rivers, preſerves the channel from being obſtructed by ice; ſo that navigation is always open, except a few days when the weather is uncommonly ſevere. The entries from foreign ports only into this port in 1795 were 941, *viz.* ſhips, 178—brigs, 309—barques, 9—ſnows, 7—ſchooners, 268—ſloops, 170. Works of defence have been erected here to a conſiderable extent, and when completed on the original plan, will afford great ſecurity to the city, from enemies' ſhips. New York city is 95 miles N. E. of Philadelphia, 127 S. W. of Hartford, 197 N. E. of Baltimore, 252 S. W. of Boſton, 375 from Portland, in Maine, 373 from Richmond, 620 from Fayetteville, 913 from Charleſton, and 1,020 from Savannah. N. lat. 40 42 8, W. long. 74 9 45.—*ib.*

New York *Iſland*, on which the city of that name ſtands, is about 15 miles long, and does not exceed two in any part in breadth. It is joined to the main land by a bridge, called King's Bridge, 15 miles N. of New York city.—*ib.*

NEYBE, or *Neiva*, a fertile plain on the ſouth ſide of the iſland of St Domingo; bounded E. by the bay and river of its name, on the W. by the river of Dames, and the Pond of Henriquelle. It contains about 80 ſquare leagues, abounds with game, and is a choſen ſpot for flamingoes, pheaſants, and royal or crowned peacocks. Theſe laſt have a more delicate flavour and more brilliant plumage than the peacocks of Europe. Nine leagues from the W. bank of the Neybe is the town, containing about 200 houſes, and can turn out 300 men fit to bear arms. This town is 15 leagues W. by N. of Azua, and 16 from the point where the line of demarcation cuts Brackiſh Pond. This territory produces a ſort of plaiſter, talc, and foſſil ſalt. The natural reproduction of the ſalt is ſo rapid, that a pretty large hollow, is abſolutely filled up again in the courſe of a year. The river might be rendered navigable for ſmall craft, and the plain is able to afford eligible ſituations for 150 ſugar plantations.—*ib.*

NIAGARA *River* and *Falls*. Niagara *river*, connects the N. E. end of Lake Erie with Lake Ontario, and is about 30 miles in length, from Fort Erie to Niagara Fort, and forms a part of the boundary between the United States and Upper Canada. It receives Chippeway or Welland river from the W. and Tonewanto Creek from the E. and emboſoms Great and Navy Iſlands. Fort Sluſher ſtands on the E. ſide of this river near Navy Iſland. The *Falls*, in this river, are oppoſite Fort Sluſher, about 7 or 8 miles ſouth of Lake Ontario, and form the greateſt curioſity which this, or indeed any other country, affords. In order to have a tolerable idea of this ſtupendous fall of water, it will be neceſſary to conceive that part of the country in which Lake Erie is ſituated, to be elevated above that which contains Lake Ontario, about 300 feet; the ſlope which ſeparates the upper and lower country is generally very ſteep, and in many places almoſt perpendicular; it is formed by horizontal ſtrata of ſtone, great part of which is lime-ſtone. The ſlope may be traced by the north ſide of Lake Ontario, near the bay of Torento, round the weſt end of the Lake; thence the direction is generally eaſt. Between Lake Ontario and Lake Erie it croſſes the ſtrait of Niagara and the Geneſſee river; after which it becomes loſt in the country towards Seneca Lake. It is to this ſlope the country is indebted both for the Cataract of Niagara and the great Falls of Geneſſee. The Cataract of Niagara, ſome have ſuppoſed, was formerly at the northern ſide of the ſlope near the landing; and that from the great length of time, and the quantity of water, and diſtance which it falls, the ſolid ſtone is worn away for about ſeven miles up towards Lake Erie, (B) and a chaſm is formed which no perſon can approach without terror. Down this chaſm the water ruſhes with a moſt aſtoniſhing noiſe and velocity, after it makes the great pitch. Here the fancy is conſtantly engaged in the contemplation of the moſt romantic and awful proſpect imaginable; when the eye catches the falls, the contemplation is inſtantly arreſted, and the beholder admires in ſilence. The river is about 742 yards wide at the falls. The perpendicular pitch of this vaſt body of water produces a ſound that is frequently heard at the diſtance of 20 miles, and

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(B) Gen. Lincoln, who viſited and examined theſe falls, in 1794, ſays, "On a careful examination of the banks of the river, there appears to be no good foundation for this opinion."

in a clear day, and fair wind, 40 and even 50 miles. A perceptible tremulous motion in the earth is felt for ſeveral rods round. A heavy cloud or fog is conſtantly aſcending from the falls, in which rainbows may always be ſeen when the ſun ſhines. This fog or ſpray, in the winter ſeaſon, falls upon the neighbouring trees, where it congeals, and produces a moſt beautiful cryſtalline appearance: this remark is applicable alſo to the Falls of Geneſſee. It is conjectured that the water muſt fall at leaſt 65 feet in the chaſm; the perpendicular pitch at the cataract is 150 feet; other accounts ſay only 137 feet: to theſe add 58 feet, which the water falls the laſt half mile immediately above the falls, and we have 273, which the water falls in the diſtance of 7½ miles. Animals ſwimming near the Rapids above the great Cataract are inſtantly hurried to deſtruction. Juſt below the Great Pitch, the water and foam may be ſeen puffed up in large ſpherical figures; they burſt at the top, and project a column of the ſpray to a prodigious height, and then ſubſide, and are ſucceeded by others which burſt in like manner. This appearance is moſt remarkable about half way between the iſland that divides the falls and the weſt ſide of the ſtrait, where the largeſt column of water deſcends. The deſcent into the chaſm of this ſtupendous cataract is very difficult, on account of the great height of the banks; but when once a perſon has deſcended, he may go up to the foot of the Falls, and take ſhelter behind the deſcending column of water, between that and the precipice, where there is a ſpace ſufficient to contain a number of people in perfect ſafety, and where converſation may be held without interruption from the noiſe, which is leſs here than at a conſiderable diſtance. On Chriſtmas night, 1795, a ſevere ſhock of an earthquake was felt here, and by which a large piece of the rock that forms the famous cataract was broken off.—*ib.*

Niagara, a fort and poſt town in the State of New York, ſituated on the E. ſide of Niagara river, at its entrance into Lake Ontario, and oppoſite to Newark, in Canada. Niagara Fort is a moſt important poſt, and ſecures a greater number of communications, through a large country, than probably any other paſs in interior America. It is about 9 miles below the cataract, 80 N. W. of Williamſburg on Geneſſee river, 370 N. W. of Philadelphia, and 560 W. by N. of Boſton. N. lat. 43 20 W. long. 79. The fort was built by the French about the year 1725, and was delivered up to the United States, according to the treaty of 1794, by the Britiſh, in 1796. Although it is a degree N. of Boſton, yet the ſeaſon is quite as mild here as at that town, and vegetation quite as early and forward. It is thought that the climate meliorates in the ſame latitude as one proceeds from the Atlantic weſtward.—*ib.*

NICARAGUA, a lake in the province of New Spain, 117 leagues in circumference. Its weſtern part is not more than 20 miles from the S. W. coaſt of Mexico. It ſends its waters eaſt to the ocean, by a ſpacious river of its name, which divides the province of Nicaragua from Coſta Rico. This renders the towns on the banks of the lake of conſiderable importance, particularly the cities of Granada, Leon, and Nicaragua. The firſt is on the ſouth ſide in lat. 11 8 N. and long. 85 12 W. and is 45 miles weſtward of the city of Nicaragua, that ſtands at ſome diſtance ſouth from the lake. Leon is at the weſt end of the lake, and in lat. 12 N. and long. 87 W. The lake is interſperſed with ſeveral iſlands, and full of fiſh, but infeſted with alligators. Nicaragua river empties into the ſea, oppoſite to the iſland of Monglares. N. lat. 11 40, W. long. 82 47.—*ib.*

Nicaragua, a maritime province of Mexico, having Honduras on the north, the North Sea on the eaſt, Coſta Rico on the S. E. and the South Sea on the S. W. It is about 400 miles long, and 120 broad. The air is wholeſome and temperate, and the ſoil fertile, producing quantities of ſugar, cochineal, and fine chocolate. This is conſidered as the garden of America; being ſo pleaſant and fruitful, that when the Spaniards firſt viſited it, they called it Mahomet's paradiſe.—*ib.*

NICHOLAS, *Cape St*, the north-weſt extremity of the iſland of St Domingo, in the Weſt Indies. It is 2 leagues W. of the town of its name, but more commonly called *The Mole*, 9 or 10 leagues eaſt of Cape Mayzi, at the eaſt end of Cuba, and 46 leagues north-eaſt by north of Cape Dame Marie, and, with this laſt cape, forms the entrance into the large bay called the Bite or Bight of Leogane.—*ib.*

Nicholas, *Port St*, on the coaſt of Peru, in S. America, lies north of Port St John, about a league to leeward of the river Maſca, and 6 leagues S. S. E. of Port Cavallo. It is ſafer than St John's harbour, but affords neither wood nor water.—*ib.*

NICKAJACK, an Indian town on the S. E. ſide of Tenneſſee river, at the point of a large bend, about 36 miles north-eaſt of the Creek's Croſſing Place. Half way between theſe lies the Crow Town, on the ſame ſide of the river.—*ib.*

NICKER, one of the ſmall Virgin Iſlands, ſituated between Anegada and Virgin Gorda, on the latter of which it is dependent. N. lat. 18 30, W. long. 65 5.—*ib.*

NICOLE (Francis), a very celebrated French mathematician, was born at Paris December 23. 1683. His early attachment to the mathematics induced M. Montmort to take the charge of his education; and he opened out to him the way to the higher geometry. He firſt became publicly remarkable by detecting the fallacy of a pretended quadrature of the circle. This quadrature a M. Mathulon ſo aſſuredly thought he had diſcovered, that he depoſited, in the hands of a public notary at Lyons, the ſum of 3000 livres, to be paid to any perſon who, in the judgment of the Academy of Sciences, ſhould demonſtrate the falſity of his ſolution. M. Nicole, piqued at this challenge, undertook the taſk, and expoſing the paralogiſm, the Academy's judgment was, that Nicole had plainly proved that the rectilineal figure which Mathulon had given as equal to the circle, was not only unequal to it, but that it was even greater than the polygon of 32 ſides circumſcribed about the circle. The prize of 3000 livres Nicole preſented to the public hoſpital of Lyons.

The Academy named Nicole, Eleve-Mechanician, March 12. 1707; Adjunct in 1716, Aſſociate in 1718, and Penſioner in 1724; which he continued till his death, which happened the 18th of January 1758, at 75 years of age.

His works were all inſerted in the different volumes of the Memoirs of the Academy of Sciences; and are as follow: 1. A General Method for determining the Nature of Curves formed by the Rolling of other Curves upon any Given Curve; in the volume for the year 1707.

1707. 2. A General Method for Rectifying all Roulets upon Right and Circular Baſes, 1708. 3. General Method of determining the Nature of thoſe Curves, which cut an Infinity of other Curves given in Poſition, cutting them always in a Conſtant Angle, 1715. 4. Solution of a Problem propoſed by M. de Lagny, 1716. 5. Treatiſe of the Calculus of Finite Differences, 1717. 6. Second Part of the Calculus of Finite Differences, 1723. 7. Second Section of ditto, 1723. 8. Addition to the two foregoing papers, 1724. 9. New Propoſition in Elementary Geometry, 1725. 10. New Solution of a Problem propoſed to the Engliſh Mathematicians, by the late M. Leibnitz, 1725. 11. Method of Summing an Infinity of New Series, which are not ſummable by any other known method, 1727. 12. Treatiſe of the Lines of the Third Order, or the Curves of the Second Kind, 1729. 13. Examination and Reſolution of ſome Queſtions relating to Play, 1730. 14. Method of determining the Chances at Play. 15. Obſervations upon the Conic Sections, 1731. 16. Manner of generating in a Solid Body all the Lines of the Third Order, 1731. 17. Manner of determining the Nature of Roulets formed upon the Convex Surface of a Sphere; and of determining which are Geometric and which are Rectifiable, 1732. 18. Solution of a Problem in Geometry, 1732. 19. The Uſe of Series in reſolving many Problems in the Inverſe Method of Tangents, 1737. 20. Obſervations on the Irreducible Caſe in Cubic Equations, 1738. 21. Obſervations upon Cubic Equations, 1738. 22. On the Triſection of an Angle, 1740. 23. On the Irreducible Caſe in Cubic Equations, 1741. 24. Addition to ditto, 1743. 25. His Laſt Paper upon the ſame, 1744. 26. Determination, by Incommenſurables and Decimals, the Values of the Sides and Areas of the Series in a Double Progreſſion of Regular Polygons, inſcribed in and circumſcribed about a Circle, 1747.*

NICOLA, or *Nichola Town Gut*, on the north-eaſt coaſt of the iſland of St Chriſtopher's.—*Morse.*

NICOYA, or *St Lucar*, a town of Coſta Rico, in the kingdom of Mexico, North America, having a harbour on a bay of the North Pacific Ocean, in lat. 10 20 N. and long. 88 10 W. About 10 leagues is the bay of Salinas, from whence the inhabitants of this place procure and ſend to Panama the purple juice of a ſhell-fiſh found in it, beſides ſalt, honey, maize, fowls and wheat; and here is alſo a pearl fiſhery. The town is up within the land, but ſhips ride in the river Cipanſo, 2 leagues to the N. W. from the iſland of Chira, to take in goods from it; which river is navigable for large periaguas that bring down the goods to the ſhips. The iſland of Chira affords plenty of freſh water and proviſions.—*ib.*

NICTAU, a river of Nova Scotia, which waters the townſhip of Annapolis; on its banks are quantities of bog and mountain ore. A bloomery has been erected in the town.—*ib.*

NICUESA, *Gulf of*, is on the eaſt coaſt of the country of Honduras, on the Spaniſh Main, having Cape Gracias a Dios for its north limit, and Cape Blanco, on the ſouth; Catherine, or Providence, is due eaſt from it.—*ib.*

NIEBE, or *Neybe*, a bay and river on the ſouth coaſt of the iſland of St Domingo. The bay is ſituated at north-north-eaſt from Cape Beata. N. lat. 18 3, W. long. 73 46.—*ib.*

NIEUWLAND (Peter), profeſſor of mathematics and natural philoſophy in the univerſity of Leyden, was born at Diemermeer, a village near Amſterdam, on the 5th of November, 1764. His father, by trade a carpenter, having a great fondneſs for books, and being tolerably well verſed in the mathematics, inſtructed his ſon himſelf till he attained to his eleventh year. Young Nieuwland appears to have diſplayed ſtrong marks of genius at a very early period. When about the age of three, his mother put into his hand ſome prints, which had fifty verſes at the bottom of them by way of explanation. Theſe verſes ſhe read aloud, without any intention that her ſon ſhould learn them; and ſhe was much ſurpriſed ſome time after to hear him repeat the whole from memory, with the utmoſt correctneſs, on being only ſhewn the prints.

Before he was ſeven years of age he had read more than fifty different books, and in ſuch a manner that he could frequently repeat paſſages from them both in proſe and in verſe. When about the age of eight, Mr Aeneæ at Amſterdam, one of the greateſt calculators of the age, aſked him if he could tell the ſolid contents of a wooden ſtatue of Mercury which ſtood upon a piece of clock-work. "Yes (replied young Nieuwland), provided you give me a bit of the ſame wood of which the ſtatue was made; for I will cut a cubic inch out of it, and then compare it with the ſtatue." Poems which (ſays his eulogiſt) diſplay the utmoſt livelineſs of imagination, and which he compoſed in his tenth year, while walking or amuſing himſelf near his father's houſe, were received with admiration, and inſerted in different poetical collections.

Such an uncommon genius muſt ſoon burſt through thoſe obſtacles which confine it. Bernardus and Jeronimo de Boſch, two of the firſt and wealthieſt men at Amſterdam, became young Nieuwland's benefactors, and contributed very much to call forth his latent talents. He was taken into the houſe of the former in his eleventh year, and he received daily inſtruction from the latter for the ſpace of four years. While in this ſituation he made conſiderable progreſs in the Latin and Greek languages, and he ſtudied philoſophy and the mathematics under Wyttenbach. In the year 1783 he tranſlated the two diſſertations of his celebrated inſtructors, Wyttenbach and de Boſch, on the opinions which the ancients entertained of the ſtate of the ſoul after death, which had gained the prize of the Teylerian theological ſociety.

From the month of September 1784 to 1785, Nieuwland reſided at Leyden as a ſtudent in the univerſity, and afterwards applied with great diligence, at Amſterdam, to natural philoſophy and every branch of the mathematics, under the direction of Profeſſor van Swinden. He had ſcarcely begun to turn his attention to chemiſtry, when he made himſelf maſter of the theory of the much-lamented Lavoiſier, and could apply it to every phenomenon. He could read a work through with uncommon quickneſs, and yet retain in his mind the principal part of its contents.

Nieuwland's attention was directed to three principal purſuits, which are ſeldom united; poetry, the pure mathematics, and natural philoſophy. In the latter part of his life he added to theſe alſo aſtronomy. Among the poems which he publiſhed, his Orion alone has rendered his name immortal in Holland. Of the ſmall eſſays which he publiſhed in his youth, the two following are particularly deſerving of notice: 1. A Comparative View of the Value of the different Branches of Science; and, 2. The beſt Means to render general, not Learning, but Soundneſs of Judgment and Good Taſte.

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* *Hutton's Dictionary.*

One of his great objects was to bring the pure mathematics nearer to perfection, to clear up and connect their different parts, and in particular to apply them to natural philoſophy and aſtronomy. Cornelius Douwes diſcovered an eaſy method of determining the latitude of a place at ſea, not by the meridian altitude of the ſun, but by two obſervations made at any other period of the day. This method, however, being ſtill imperfect, Nieuwland turned his thoughts towards the improvement of it, and in the beginning of the year 1789 wrote a paper on the ſubject, which he tranſmitted to M. de Lalande at Paris, from whom it met with great approbation. In the year 1792, when Nieuwland reſided two months at Gotha with Major von Zach, theſe two learned men often converſed on this method of finding the latitude, and calculated the reſult of obſervations which they had made with a ſextant and an artificial horizon. The above paper, enlarged by theſe obſervations, was inſerted by Major von Zach with Nieuwland's name in the firſt Supplement to Bode's Aſtronomical Almanack, Berlin, 1793.

This, however, was not the only ſervice which Nieuwland endeavoured to render to aſtronomy. It had been obſerved by Newton, Euler, De la Place, and others, that the axes of the planets do not ſtand perpendicular, but inclined, to the plane of their orbits; and Du Sejour, in his analytical treatiſe on the apparent motion of the heavenly bodies, conſiders it as highly probable that this phenomenon depends on ſome *phyſical* cauſe; which, however, he does not venture to aſſign. Nieuwland proceeded farther, and laid down principles, from which he drew this concluſion, that the above phenomenon is intimately connected with the whole ſyſtem of attraction. On theſe principles he made calculations, the reſult of which was exactly equal to the angle of the inclination of the earth's axis to the plane of its orbit. Nieuwland communicated his diſcovery with much modeſty to the celebrated Profeſſor Damen at Leyden, who propoſed ſome objections to it which diſcouraged Nieuwland, and induced him to reviſe his calculations with more accuracy. Major von Zach tranſmitted the paper which contained them to M. De la Place at Paris, and cauſed it to be printed alſo, for the opinion of the learned, in the Supplement to Profeſſor Bode's Aſtronomical Almanack for the year 1793.

The writer of this article is not acquainted either with the principles which this young aſtronomer aſſumed, or with the calculations which he made from them; but if he holds gravitation to be eſſential to matter, and the inclination of the axes of the planets to be the neceſſary reſult of the law of gravitation, he is undoubtedly in an error. The axes of the planets are not all equally inclined, nor does the inclination vary in exact proportion to the ſquares of the diſtances.

Nieuwland's talents and diligence ſoon recommended him to the notice of his country. In his twenty-ſecond year, he was appointed a member of the commiſſion choſen by the College of Admiralty at Amſterdam for determining the longitude and improving marine charts. On this labour he was employed eight years, and undertook alſo to prepare a nautical almanack, and to calculate the neceſſary tables. The mathematical part was in general entruſted to Nieuwland; but he aſſiſted alſo his two colleagues van Swinden and van Keulen, in the departments aſſigned to them, with ſuch aſſiduity, that moſt of the work publiſhed on the longitude, together with the three additional parts, were the fruits of his labour. In the ſecond edition of the explanation of the nautical almanack, he had alſo the principal ſhare; and he was the author, in particular, of the explanation of the equation of time, the method of determining the going of a time-piece, and of calculating the declination of the moon.

Soon after Nieuwland engaged in this employment, it appeared as if his deſtination was about to be changed. In the year 1787, he was choſen by the States of Utrecht to ſucceed Profeſſor Hennert; but on account of certain circumſtances this appointment did not take place. He was, however, invited to Amſterdam by the magiſtrates of that city, to give lectures on mathematics, aſtronomy, and navigation. While in this ſituation, he wrote his uſeful and excellent treatiſe on navigation, the firſt part of which was publiſhed at Amſterdam in 1793, by George Hulſt van Keulen; and it is much to be wiſhed that M. van Swinden would complete this work from the papers bequeathed to him by his deceaſed friend the author.

In aſtronomical purſuits, Nieuwland applied not only to the theoretical, but alſo to the practical part; and in this ſtudy he was encouraged and aſſiſted by Major von Zach, with whom he reſided ſome time in the courſe of the year 1792, and who inſtructed him in the proper uſe of the ſextant. This affectionate friend publiſhed alſo all his obſervations and calculations in the before-mentioned Supplement to Bode's Aſtronomical Almanack.

In the year 1789, Nieuwland was choſen member of a learned ſociety whoſe object was chemical experiments; and ſo apt was his genius for acquiring knowledge, that in a little time he made himſelf completely maſter of the theory of chemiſtry. A proof of this is the treatiſe which he read on the 24th of May 1791, in the ſociety, diſtinguiſhed by the motto of *Felix Meritis*, and which has been printed in the firſt part of the New General Magazine (*Niew Algemeen Magazyn*). At the ſame time he was able to examine the important diſcoveries made by the ſociety, to aſſiſt in preparing an account of them for the preſs, and to publiſh them with ſufficient accuracy in the French language. Three parts of this work appeared under the title of *Recherches Phyſico-chymiques*. The firſt part appeared in 1792, and was afterwards reprinted in the *Journal de Phyſique*. The ſecond was publiſhed in 1793, and the fourth in 1794. Some letters of his on chemiſtry may be found alſo in a periodical work called *The Meſſenger* (*Letterbode*).

This ingenious and diligent man was of great ſervice alſo in the philoſophical department to the above ſociety, *Felix Meritis*, of which he had been choſen a titular member on the 25th of January 1788, and an honorary member on the 15th of March 1791. The papers for which it was indebted to him are as follows:—1. On the Neweſt Diſcoveries in Aſtronomy, and the Progreſs lately made in that Science, 1788. This is an extract from a Latin oration which he intended to

Nieuwland,
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Nieva.

deliver at Utrecht when he expected to ſucceed Profeſſor Hennert.—2. On the Figure of the Earth, 1789. —3. On the Courſe of Comets, and the Uncertainty of the Return of the Comet now Expected, 1790.— 4. On the Nature of the Mathematics. The principal object of this paper was to illuſtrate the idea, that the mathematics may be conſidered as a beautiful and perfect language.—5. On the Periodical Decreaſe or Increaſe in the Light of Certain Fixed Stars, and Particularly of the Star Algol, 1790.—6. On the Solution of Spherical Trigonometry by Means of a New Inſtrument Invented by Le Guin, 1791. M. le Guin having tranſmitted to the College of Admiralty at Amſterdam an inſtrument which might be uſed with great advantage in trigonometrical operations, and by which, in calculating the longitude, one could deduce the real from the apparent diſtance, the admiralty charged Nieuwland to examine this inſtrument; and he found that it might be of excellent ſervice for the above purpoſe.—7. On the Relative Value or Importance of the Sciences, 1791.—8. On the Syſtem of Lavoiſier, 1792. —9. On the Selenotopographia of Schröder, 1793.— 10. On what is Commonly Called Cultivation, Inſtruction, or Enlightening, 1793.

Nieuwland had applied cloſely to the mathematics, aſtronomy, and navigation, for ſix years; during which time he made conſiderable improvements in nautical charts, and filled up his vacant hours with the ſtudy of philoſophy and chemiſtry. In the month of July 1793 he was invited to the univerſity of Leyden, to be profeſſor of philoſophy, aſtronomy, and the higher mathematics, in the room of the celebrated Damen; and the admiralty of Amſterdam requeſted him to continue his nautical reſearches, which he did with great aſſiduity till the period of his death. The only variation which he now made in his ſtudies related to natural philoſophy, for with the mathematics he was already ſufficiently acquainted. He applied therefore to the experimental part, and ſpared no pains nor labour to become perfect in it; which would certainly have been the caſe, had he not been ſnatched from ſcience and his friends at the early age of thirty. He died of an inflammation in his throat, accompanied with a fever, on the 13th of November 1794.

In his external appearance, Nieuwland was not what might be called handſome, nor had he ever been at pains to acquire that eaſe of deportment which diſtinguiſhes thoſe who have frequented polite company. His behaviour and converſation were however agreeable, becauſe he could diſcourſe with facility on ſo many ſubjects, and never wiſhed to appear but under his real character. On the firſt view one might have diſcerned that he was a man of great modeſty and the ſtricteſt morality. His father was a Lutheran, and his mother a baptiſt; but he himſelf was a member of what is called the reformed church, *i. e.* a Calviniſt, and always ſhewed the utmoſt reſpect for the Supreme Being both by his words and his actions.

NIEVA *Iſland*, lies ſouth-weſt of Miſtake Bay, and on the north-eaſt ſide of Hudſon's Straits.—*ib.*

NIEVA TERRA, near the eaſt end of Hudſon's Straits, in North America, in lat. 62 4 N. and long. 67 7 W. and has high water on the ſpring-tide days at 50 min. paſt 9 o'clock.—*ib.*

Niganiche,
‖
Niger.

NIGANICHE, an iſland on the coaſt of Cape Breton Iſland, and in the ſouth part of the Gulf of St Lawrence, is to the ſouthward of a cape about 4 leagues ſouth-ſouth-weſt of Achepe harbour, and 8 leagues from North Cape.—*ib.*

NIGER, a large river in Africa, of which many erroneous accounts have been publiſhed, and among them that which we have given in the *Encyclopædia.* By Herodotus, Pliny, Ptolemy, and other ancient authors, it is uniformly ſaid to flow from *weſt* to *eaſt*, dividing Africa as the Danube divides Europe; and from the report of the Africans, the firſt of theſe authors calls it a large river abounding with crocodiles. In the twelfth century, however, Edriſi deſcribes the Niger, which he calls the Nile of the negroes, as running from *eaſt* to *weſt*, and falling into the Atlantic Ocean; and his account was univerſally adopted by ſubſequent writers, till its falſehood was diſcovered by the African Aſſociation. From a number of concurring reports, Major Houghton was led to believe that the courſe of the Niger is from *weſt* to *eaſt*, according to the moſt ancient account; and the truth of theſe reports has been eſtabliſhed beyond all controverſy by Mr Park, who ſaw the Niger himſelf, and actually accompanied it for many miles in its majeſtic courſe as laid down by Herodotus.

This river riſes in or near the country of MANDING (which ſee in this *Supplement*), between the parallels of 10 and 11 degrees of north latitude, and between the 5th and 9th degree of weſt longitude, which comprehends a ſpace the moſt elevated of all this portion of Africa. This is evident from the oppoſite courſes of the three great rivers which riſe in it. Theſe are the Gambia, which runs to the weſt-north-weſt; the Senegal, which runs to the north-weſt; and the Joliba (A), or Niger, running to the eaſt-north-eaſt. The head of the principal branch of the Senegal river is about 80 geographical miles to the weſt of that of the Niger; and the head of the Gambia is again about 100 miles weſt of the Senegal.

Mr Park traced the Niger to Silla, a conſiderable town about 420 miles from its ſource; and it was there larger than the Thames at Weſtminſter. But 420 miles are but a very ſmall part of the courſe of the Niger, which doubtleſs receives many tributary ſtreams before it reach Kaſſina, 700 miles farther eaſtward, where there is every reaſon to believe that it was viewed by the ancient Romans. Our traveller collected at Silla what information he could from the Mooriſh and Negro traders concerning the further courſe of this majeſtic ſtream, as well as of the kingdoms through which it runs; and the following notices he believes to be authentic:

Two ſhort days journey to the eaſtward of Silla, is the town of Jenne, which is ſituated on a ſmall iſland in the river; and is ſaid to contain a greater number of inhabitants than Sego itſelf, or any other town in Bambarra. (See SEGO, *Suppl.*). At the diſtance of two days more, the river ſpreads into a conſiderable lake, called *Dibbie* (or the dark lake); concerning the extent of

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(A) This is the negro name of the river, and ſignifies the *great water*.

of which, all the information which our author could obtain was, that in croſſing it, from weſt to eaſt, the canoes loſe ſight of land one whole day. From this lake, the water iſſues in many different ſtreams, which terminate in two large branches, one whereof flows towards the north-eaſt, and the other to the eaſt; but theſe branches join at Kabra, which is one day's journey to the ſouthward of Tumbuctoo, and is the port or ſhipping-place of that city. The tract of land which the two ſtreams encircle, is called Jinbala, and is inhabited by negroes; and the whole diſtance by land, from Jenne to Tumbuctoo, is twelve days journey.

From Kabra, at the diſtance of eleven days journey, down the ſtream, the river paſſes to the ſouthward of Houſſa, which is two days journey diſtant from the river. Of the further progreſs of this great river, and its final exit, all the natives with whom Mr Park converſed ſeemed to be entirely ignorant. Their commercial purſuits ſeldom induce them to travel further than the cities of Tumbuctoo and Houſſa; and as the ſole object of thoſe journeys is the acquirement of wealth, they pay but little attention to the courſe of rivers, or the geography of countries. It is, however, highly probable that the Niger affords a ſafe and eaſy communication between very remote nations. All our author's informants agreed, that many of the negro merchants who arrive at Tumbuctoo and Houſſa, from the eaſtward, ſpeak a different language from that of Bambarra, or any other kingdom with which they are acquainted. But even theſe merchants, it would ſeem, are ignorant of the termination of the river; for ſuch of them as can ſpeak Arabic, deſcribe the amazing length of its courſe in very general terms, ſaying only, that they believe *it runs to the world's end.*

Major Rennel, by comparing a great many accounts of the progreſs of this river beyond Houſſa, with the idea which prevails in that city of its termination, has ſhewn it to be in a very high degree probable, that the waters of the Niger have no direct communication with the ſea, but that they are ſpread out into a great lake in Wangara and Ghana, and evaporated by the heat of the ſun. See WANGARA in this *Supplement.*

NIGUA, a river on the ſouth ſide of the iſland of St Domingo. Its mouth is 7 leagues eaſt of the Niſao. The rivers Nigua and Jayna are not very far apart. But as they advance from their ſprings, they recede from each other, the former running weſtward from the latter. Between them lies an extenſive and fertile plain. The quantity of pure gold that was dug from its cavities, its ſugar, cocoa, indigo, and other plantations, paid duties of a greater amount than thoſe now paid by all the Spaniſh part of the iſland put together. All theſe rivers might be eaſily rendered navigable. The pariſh and ſmall town of Nigua contain about 2,500 perſons, partly free people of colour.—*Morse.*

NILE, the name of a celebrated river, which, as it has been deſcribed in the *Encyclopædia,* ſhould not have been introduced into this place, did we not think ourſelves bound candidly to confeſs that, in our opinion, its ſources, at leaſt thoſe ſources which were the objects of ancient curioſity, have never yet been ſeen by any European. This ſeems to be proved, beyond the poſſibility of controverſy, by Major Rennel in the Appendix to Mr Park's Travels, and by Mr Browne in his account of the *Bahr-el-abiad,* and *Dar-Fur* or *Soudan.* See SOUDAN in this *Supplement.*

Mr Bruce himſelf acknowledges that the Nile, which waters Egypt, is the confluence of two ſtreams, and that the weſtern ſtream, which he, with others, calls *Bahr-el-abiad,* or the *white river,* is the largeſt of the two. Were a man therefore to travel from Cairo up the banks of the Nile in queſt of its ſource, he would, doubtleſs, when he ſhould arrive at the diviſion of the river into two channels, continue his journey up the greater of theſe; for what could induce him to turn aſide with the leſs? Not the *name;* for neither the leſs nor the greater has by itſelf the name which, in Egypt, is given to both when united. The former, which undoubtedly has its ſource in Abyſſinia, is there called the Abay or Abavi; and, in other countries through which it runs, the Bahr el Afrek; the latter is, from its ſource to its junction with the Abay, called the Bahr el abiad. Pliny believed that the Nile came from the weſt; and Ptolemy ſays expreſsly that its remote ſource is in the *mountains of the moon.* But this Nile muſt be the White River, which certainly riſes to the weſtward of Abyſſinia, and, according to Abulfeda, in the mountains of Komri or Kummeri; which, in Arabic, ſignifies *lunar,* being the adjective of Kummer, the moon.

In perfect conformity with this ancient account of the ſource of the Nile, Mr Ledyard was told at Cairo by certain perſons from Dar-Fur, that this celebrated river has its coy fountains in their country, at the diſtance of 55 days journey to the weſtward of Senaar, which brings them to the Komri mountains of Abulfeda, who, as well as Ptolemy and Edriſi, places the head of the Nile in a quarter far removed from Abyſſinia. Ptolemy has indeed mentioned both branches; and while he deſcribes the eaſtern in ſuch a way as that it cannot be taken for any other than the Abyſſinian branch, or the Nile of Bruce and the Portugueſe Jeſuits, ſpeaks of a larger branch flowing from a more diſtant ſource, ſituated to the ſouth-weſt. But this can be no other than Bruce's white river, the *Bahr-el-abiad* of Ledyard and Browne. It is true, there is an apparent difference in the account given by theſe two laſt mentioned travellers of the country in which the Bahr-el-abiad riſes; but it is a difference only apparent. Ledyard was told at Cairo that it riſes in Dar-Fur; Mr Browne, who reſided long in Dar-Fur, was there told, that the ſources of the river are near to a place called *Donga,* the reſidence of the chief or king of an idolatrous nation to the ſouthward of Dar-Fur. It is to be obſerved, however, that the ſlave-merchants who trade between Donga and Cairo are always attached to the Soudan or Dar-Fur caravan; and that therefore the perſons who told Ledyard that the Nile riſes in their country were probably from Donga, though he took them for Furians from the name of their caravan. Mr Browne informs us, that the country about Donga is very mountainous, and that in the ſpot where the river riſes there are ſaid to be forty diſtinct hills, which are called *Kumri.* From them iſſues a great number of ſprings, that, uniting into one great channel, form the Bahr-el-abiad, which ſuffers the ſame periodical increaſe and diminution as the Nile in Egypt. The people of Donga are quite naked, black, and, as we have already obſerved, idolaters.

ters. Major Rennel places the mountains of the moon between 5° 40′ and 8° 10′ N. Lat. and between 24° 30′ and 30° 25′ E. Long. Their latitude and longitude, as laid down by Mr Browne, are ſomewhat, tho' very little, different; whilſt Geeſh, the ſource of Bruce's Nile, lies between the 10th and 11th degree of N. Lat. and in about the 37th degree of E. Long.

NIMIQUAS, a nation, or, more properly, two tribes in South Africa, called by Vaillant the *Leſs* and *Greater* Nimiquas.

The country of the Leſs Nimiquas extends in longitude from the mountains of Camis to the ſea on the weſt, *i. e.* from 15° 25′ to 18° 25′ eaſt from London, and in latitude from 28° 12′ to 29° 36′ ſouth. From the information which our author could collect, he thinks that the number of inhabitants throughout the whole of this tract does not exceed 6000 ſouls. Even this number is annually diminiſhed by the frequent attacks of Boſhmen, and the aridity of the ſoil. Of the Boshmen we have already given ſuch an account as can leave no doubt of the deſtructive nature of their incurſions; and the ſoil muſt be arid indeed, if it be true, as Vaillant aſſures us, that in the country of the Leſs Nimiquas rain never falls except when it thunders, and that thunder is ſo rare as frequently not to be heard for the ſpace of a whole year.

For this want of rain our author accounts in a ſatisfactory manner: "The country (he ſays) having neither foreſts nor lofty mountains to arreſt the clouds, thoſe which come from the north paſs freely over it, and proceed on to Camis, where they burſt and fall, either in rain in the valleys, or in ſnow on the ſummits of theſe mountains, which are the loftieſt throughout the ſouth of Africa." The country is of courſe not fruitful, and its ſterility obliges the inhabitants frequently to change their reſidence, ſo that they are the moſt wandering of all the Hottentot tribes. In this barren region the Dutch coloniſts ſuppoſe that gold mines may be found; but our author diſcovered among the hordes no traces of this metal, though he found many indications of rich copper mines.

The Leſs Nimiquas, though of a tolerable ſtature, are not ſo tall as their neighbours to the eaſtward; and indeed Vaillant affirms, that the people to the eaſt in the ſouthern part of Africa are much ſuperior to thoſe of the weſt both in moral and phyſical qualities, while the animals are far inferior. The Leſs Nimiquas are great believers in witchcraft; and our author gives a ridiculous account of an interview that he had with an old witch named *Kakoes*, who had a complete aſcendency, not only over the whole horde, but alſo over the ſavage Boſhmen. Theſe robbers, he ſays, never attempted to plunder the territory where ſhe took up her reſidence; and ſhe has been known, when their thefts came to her knowledge, to proceed alone, and unguarded, to their retreats in the midſt of the woods, to threaten them with her vengeance, and thus compel them to a reſtitution of the ſtolen property. All her influence, however, over her own tribe, could procure for our author and his attendants only ſix ſheep.

The women of the horde received his Hottentots with great kindneſs; and permitted them to diſcover very ſingular charms, of which it is needleſs here to inſert a deſcription. Among this people he ſaw abundance of bracelets, necklaces, and ear-rings of copper; and ſome of theſe ornaments were ſo well made and finely poliſhed, that they muſt have been manufactured in Europe, and the fruits of an intercourſe with the whites. But he ſaw ſeveral others, which, from their groteſque ſhape and rude workmanſhip, evidently ſhewed that they were fabricated by the ſavages themſelves.

"Theſe ornaments (ſays he) are worn by the Nimiquas in the ſame manner as by the other ſavages; yet I obſerved among them ſome whimſical peculiarities. I have ſeen perſons with ſix ear-rings of the ſame ſhape in one ear, and none in the other: I have ſeen ſome with bracelets from the wriſt to the elbow on one arm, while the other arm was bare: I have ſeen others with one ſide of the face painted in compartments of various colours, while on the other ſide both the colours and figures were different. In general, I obſerved great propenſity to ornaments among the Leſs Nimiquas; for their kroſſes and all their garments were plentifully covered with glaſs and copper beads, ſtrung on threads, and faſtened on every part of their dreſs. They even wore them in their hair, which was plaſtered with greaſe in the moſt diſguſting manner. Many had their heads covered with a reddiſh incruſtation, compoſed of greaſe and a powder reſembling brick duſt, with which their hair was ſo paſted together, that you would have ſworn it to be a cap of red morter. Thoſe who had it in their power to diſplay this luxury of dreſs, were as proud as are our *petits-maitres*, when they can ſhake a head loaded with powder, perfume, and pomatum. The *nuyp-kros*, or ſhort apron, of the women, was adorned with rows of glaſs beads hanging down to their feet; in other reſpects they were dreſſed like the other Hottentots."

The country of the *Greater Nimiquas* is placed by the author in nearly the ſame longitude with that of the Leſs, and between 25° and 28° ſouth latitude. It is barren like the other; but the people are much taller, being generally about five feet ten inches high. The men are dull and ſtupid, but the women are lively and extremely amorous; and both men and women are comparatively handſome and of a ſlender make. Extravagantly addicted to ſmoking tobacco, the young girls bartered their favours for a ſingle pipe; and as Vaillant was chief of the caravan, a white, and poſſeſſor of tobacco of much better quality, many advances were made to him. "I have no doubt (ſays he) but I might have formed, for a few pipefuls only, an alliance with every family in the horde. I was even preſſed ſo cloſely, as to be obliged to employ ſome reſiſtance: but, at the ſame time, I muſt confeſs, that my refuſals were given in ſuch a way as not to offend; and they who, in conſequence of their advances, had been expoſed to them, having ſoon found other arrangements to make, did not ſhew me the leſs friendſhip. I muſt here add, that the girls alone appeared to me thus free; while the married women on the contrary were modeſt and reſerved. This is a characteriſtic difference, which diſtinguiſhes the Greater Nimiquas from the Hottentot people in general; as likewiſe does the low cringing air they aſſume when they have any thing to aſk."

It has been ſaid by Kolben, that the Nimiqua women, when they bear twins, deſtroy one of the infants; but Vaillant aſſures us that this is a falſehood, as is likewiſe another tale which is current in the colony. It has been ſaid that the fathers, to ſhew what affection

Nimiquas.

they bear their children, feed their eldeſt in a particular manner, as being of right the firſt object of paternal care. For this purpoſe they put him in a coop as it were; that is, they ſhut him up in a trench made under their hut, where, being deprived of motion, he loſes little by perſpiration, while they feed and cram him in a manner with milk and greaſe. By degrees the child fattens, and gets as round as a barrel; and when he is come to ſuch a ſtate as not to be able to walk, but to bend under his own weight, the parents exhibit him to the admiration of the horde; who from that period conceive more or leſs eſteem and conſideration for the family, according as the monſter has acquired more or leſs rotundity.

Such was the account given to our author by a man who affirmed that he had been an eye witneſs of this mode of cramming the heir-apparent; but whenever any queſtions were aſked on the ſubject of the Nimiquas themſelves, the perſons addreſſed were ready to laugh in our author's face. "Still (ſays he), as it appeared ſtrange to me, that a man ſhould talk of what he had ſeen, when he had in reality ſeen nothing; as it was poſſible that the fable might have ſome foundation, without being true in all particulars—I was willing to convince myſelf what could have given riſe to it; and every time I viſited a horde, I took care, under different pretences, to examine, one after another, all the huts of the kraal, and to aſk which was the eldeſt child of the family: but I nowhere ſaw any thing that indicated either this pretended coop, or this pretended cramming."

The Nimiquas are great cowards; yet, like the ſurrounding nations, they have their aſſagays and poiſoned arrows; and, like them, can handle theſe arms with dexterity. They poſſeſs alſo thoſe war oxen, ſo formidable in battle, and ſo favourable to the cowardice or inactivity of the combatants. They have even a peculiar implement of war, which their neighbours have not. This is a large buckler, of the height of the perſon who bears it, behind which the Nimiqua can completely conceal himſelf. But, beſide that his natural apathy prevents him from giving or taking offence, he is in reality puſillanimous and cowardly from the coldneſs of his diſpoſition. To utter only the name of *Houzouana* before him is ſufficient to make him tremble. See Houzouanas in this *Suppl.*

Notwithſtanding his frigidity, the Nimiqua is not inſenſible to pleaſure. He even ſeeks with avidity thoſe which, requiring but little exertion, are capable of agitating him and procuring agreeable ſenſations. Their muſical inſtruments are the ſame as thoſe of the other Hottentots; but their dancing is very different, and reſembles the temper of the nation. If the countenance have received from nature features that can expreſs our paſſions, the body alſo has its attitudes and movements that paint our temper and feelings. The dance of the Nimiqua is frigid like himſelf, and ſo devoid of grace and hilarity, that, were it not for the extreme gaiety of the women, it might be called the dance of the dead.

Theſe tortoiſes, to whom dancing is a fatigue, ſhew little eagerneſs for any thing but wagers, games of calculation and chance, and all the ſedentary amuſements which require patience and reflection, of which they are more capable than they are of motion. When our author, with great propriety, prohibited gaming in his camp, the Nimiquas, who had ſtaid long with him, took their departure.

Ninety-Six, Nizolius.

NINETY-SIX, a diſtrict of the upper country of South Carolina, weſt of Orangeburg diſtrict, and comprehends the counties of Edgefield, Abbeville, Laurens, and Newbury. It contains 33,674 white inhabitants, ſends 12 repreſentatives and 4 ſenators to the State legiſlature, 3 of the former and one of the latter for each county, and one member to Congreſs. It produces conſiderable quantities of tobacco for exportation. Chief town, *Cambridge*, or, as it was formerly called, *Ninety-Six*, which is 60 miles weſt by north of Columbia, 147 north weſt of Charleſton, 49 north of Auguſta in Georgia, and 762 from Philadelphia. In May, 1781, this town was cloſely beſieged by Gen. Greene, and bravely defended by the Britiſh, commanded by Col. Cruger.—*Morſe.*

NIPEGON, a large river which empties into Lake Superior, from the northward. It leads to a tribe of the Chippewas, who inhabit near a lake of the ſame name. Not far from the Nipegon is a ſmall river, that, juſt before it enters the lake, has a perpendicular fall, from the top of a mountain of 600 feet. It is very narrow, appears like a white garter ſuſpended in the air. —*ib.*

NIPISSING *Lake* is north-eaſt of Lake Huron, and connected with it by French river.—*ib.*

NIPISSINS. Indians inhabiting near the head waters of the Ottowas river. Warriors 300.—*ib.*

NISAO, a river which riſes in the centre of the iſland of St Domingo, and falls into the ſea on the ſouth ſide, and on the weſtern ſide of the point of its name; 7 leagues W. of Nigua river.—*ib.*

NISQUEUNIA, a ſettlement in the State of New York, above the city of Albany. This is the principal ſeat of the ſociety called Shakers. A few of this ſect came from England in 1774; and a few others are ſcattered in different parts of the country.—*ib.*

NITTA, a ſpecies of the Mimosa, which flouriſhes on the banks of the Senegal in Africa. It is valuable to the inhabitants for its fruit, the pods of which are long and narrow, containing a few black ſeeds enveloped in a fine mealy powder, of a bright yellow colour, which reſembles the flour of ſulphur, and has a ſweet mucilaginous taſte. When eaten by itſelf it is clammy; but when mixed with milk or water, it conſtitutes a very pleaſant and nouriſhing food, ſupplying the place of corn to the negroes.—*Park's Travels.*

NITTANY *Mountain*, in Pennſylvania, is between the Juniatta and the W. branch of Suſquehannah river. —*Morſe.*

NIVERNOIS, a large bay at the eaſt end of Lake Ontario.—*ib.*

NIXONTON, a poſt town of N. Carolina, and capital of Paſquotank county; lies on a northern water of Albemarle Sound, and contains a court-houſe, gaol, and a few dwelling houſes. It is 28 miles N. E. of Edenton, and 468 S. W. of Philadelphia.—*ib.*

NIZOLIUS (Marius), a grammarian of Italy, who by his wit and erudition contributed much to the promotion of letters in the 16th century. He publiſhed, in 1553, *Lib.* 4. *De veris Principiis et vera Ratione philoſophandi, contra Pſeudo philoſophos.* In this work he attacks, with much vivacity, the ſchoolmen, not only ly for the barbariſm of their terms, but for many ridiculous opinions which they held. Leibnitz was ſo ſtruck with its ſolidity and elegance, that, to expoſe the obſtinacy of thoſe who were zealouſly attached to Ariſtotle, he gave a new edition of it, with critical notes of his own, 1670, in 4to. Nizolius publiſhed alſo, *Theſaurus Ciceronianus, ſive Apparatus Linguæ Latinæ e Scriptis Tullii Ciceronis collectus*, in folio. This is a good Latin dictionary, compoſed of the words and expreſſions of Cicero; to which, it ſeems, Nizolius ſhewed as much bigotry as the ſchoolmen to their notions; and fell under the character of thoſe pedants whom Eraſmus has ridiculed in his *Ciceronianus*. We do not find the year either of his birth or death. *Biog. Dictionary.*

NOBLEBOROUGH, a townſhip in Lincoln county, Diſtrict of Maine, incorporated in 1788, and contains 516 inhabitants. It is 10 miles S. E. of New-Caſtle, and 192 N. E. of Boſton.—*Morſe.*

Nobleborough, a townſhip in the north-eaſtern part of Herkemer county, New York, ſituated on the north-weſtern ſide of Canada Creek.—*ib.*

NOCKAMIXON, a townſhip in Buck's county, Pennſylvania.—*ib.*

NOCTURNAL Arch, is the arch of a circle deſcribed by the ſun, or a ſtar, in the night.

NODDLE's *Iſland*, a ſmall pleaſant and fertile iſland in Boſton harbour, Maſſachuſetts. It is about 2 miles eaſt north-eaſt of the town, on the Chelſea ſhore. It is occupied as a farm, and yields large quantities of excellent hay.—*Morſe.*

NODWAY, a river or rather a long bay which communicates with James' Bay, at the S. E. extremity of Rupert's river.—*ib.*

NOIR, or *Black River*, in Louiſiana, runs ſouthward, and joins Rouge or Red River.—*ib.*

Noir, *Cape*, on the S. W. coaſt of the iſland of Terra del Fuego, at the entrance of the Straits of Magellan. S. lat. 54 30, W. long. 73 13.—*ib.*

NOIX, *Iſle au*, or *Nut Iſle*, a ſmall iſle of 50 acres, near the north end of Lake Champlain, and within the province of Lower Canada. Here the Britiſh have a garriſon containing 100 men. It is about 5 miles N. N. E. of the mouth of La Cole river, 20 north of Iſle La Motte, and 12 or 15 ſouthward of St John's.—*ib.*

NOLACHUCKY, a river in the eaſtern part of the State of Tenneſſee, which runs W. S. W. into French Broad river, about 26 miles from Holſton river. Near the banks of this river Grenville college is eſtabliſhed. —*ib.*

NOLIN *Creek*, a branch of Green river in Kentucky. The land here is of an inferior quality.—*ib.*

NOMAN's *Land Iſland*, lies a little S. W. of Martha's Vineyard, and is about 3 miles long and two broad. It belongs to Duke's county, Maſſachuſetts. N. lat. 41 15, W. long. 71 5.—*ib.*

NOMBRE de DIOS, a port to the S. S. E. of the cape to the eaſtward of Porto Bello, on the Spaniſh Main, or N. coaſt of S. America, at the diſtance of about 7 leagues. It is at the bottom of a large deep bay, being wide to the eaſt ſide in lat. 9 43 N. and long 78 35 W. The iſlands called Baſtimentos are in this bay. Large veſſels ſeldom frequent this part now, although there is from 5 to 8 fathoms and clean ground. Experience pointed out that they were in danger of foundering at anchor, ſuch is the fury with which the ſea pours into the bay. Thoſe veſſels that now viſit it, if their buſineſs require any ſtay, prefer riding at the Baſtimentos, or at Porto Bello.—*ib.*

Nombre de Dios, on the W. coaſt of Mexico, ſituated on the North Pacific Ocean, is a large and populous town, a little to the northward of the tropic of Cancer, and 20 leagues to the north of Guadalaxara. N. lat. 23 38, W. long. 104.—*ib.*

NONAGESIMAL, or Nonagesimal *Degree*, called alſo the *Mid heaven*, is the higheſt point, or 90th degree of the ecliptic, reckoned from its interſection with the horizon at any time; and its altitude is equal to the angle that the ecliptic makes with the horizon at their interſection, or equal to the diſtance of the zenith from the pole of the ecliptic. It is much uſed in the calculation of ſolar eclipſes.

NONAGON, a figure having nine ſides and angles. In a regular nonagon, or that whoſe angles and ſides are all equal, if each ſide be 1, its area will be $6{\cdot}1818242 = \frac{9}{4}$ of the tangent of 70°, to the radius 1.

NONESUCH, a river of Cumberland county, Diſtrict of Maine. It paſſes to the ſea through the town of Scarborough; and receives its name from its extraordinary freſhets.—*Morſe.*

Nonesuch, a harbour at the E. end of the iſland of Antigua. The road is foul and full of rocks; and it has not more than 6 or 8 feet water, except in one place, which is very difficult.—*ib.*

NOOHEEVA, one of the Ingraham Iſlands, ſaid to be the parent of them all, ſituated about 10 leagues S. W. of Ooahoona. Capt. Roberts named it *Adams*; it is the ſame which Ingraham called *Federal Iſland.* The lat. of the body of the iſland is 8 58 S. and nearly in the ſame meridian with Wooapo, between 140 and 140 10 W. long. from Greenwich. All accounts of the natives concurred, ſays Capt. Roberts, in repreſenting it as populous and fruitful, and to have a large bay with good anchorage.—*ib.*

NOORT *Point*, on the coaſt of Chili, is the north point of the bay or port of Coquimbo, the other is called Point Tortugas.—*ib.*

NORFOLK, a populous maritime county of Maſſachuſetts, lately taken from the ſouthern part of Suffolk county, and lies to the ſouthward around the town and harbour of Boſton. And contains 20 townſhips, of which Dedham is the ſeat of juſtice. Number of inhabitants 24,280.—*ib.*

Norfolk, a populous county of Virginia, bounded north by James's river, which divides it from Warwick. It contains 14,524 inhabitants, including 5,345 ſlaves. —*ib.*

Norfolk, a port of entry and poſt town and ſeat of juſtice in the above county, on the eaſt ſide of Elizabeth river, immediately below the confluence of the eaſtern branch. It is the moſt conſiderable commercial town in Virginia. The channel of the river is from 350 to 400 yards wide, and at common flood tides has 18 feet water up to the town. The harbour is ſafe and commodious, and large enough to contain 300 ſhips. It was burnt on the 1ſt of January, 1776, by the Liverpool man of war, by order of the Britiſh governor Lord Dunmore; and the loſs amounted to £300,000 ſterling. It now contains about 500 dwelling houſes, a court houſe, gaol, an epiſcopal and methodiſt church, a theatre, and and an academy. In 1790, it contained 2,959 inhabitants, including 1294 ſlaves. The town is governed by a mayor and ſeveral aldermen. It carries on a briſk trade to the Weſt-Indies, Europe and the different ſtates, and conſtitutes, with Portſmouth, which ſtands on the oppoſite ſide of the river, a port of entry. The exports for one year, ending September 30th, 1794, amounted to 1,660,752 dollars. A canal, of 16 miles in length, is now cutting from the north branch of Albemarle Sound in N. Carolina, to the waters of the S. branch of Elizabeth river. It will communicate with Elizabeth river 9 miles from Norfolk. Merchant veſſels of the largeſt ſize may go within a mile from the mouth of the canal; and here, the water being freſh, the worm, which does ſuch damage to veſſels in Norfolk and Portſmouth, will not affect them. It is 114 miles E. S. E. of Richmond, 54 from Williamſburg, 30 N. E. of Suffolk, and 389 S. by W. of Philadelphia. N. lat. 36 55, W. long. 76 28.—*ib.*

Norfolk, a townſhip in Litchfield county, Connecticut, 15 miles north of Litchfield, on the Maſſachuſetts line.—*ib.*

NORMAL, is uſed ſometimes for a perpendicular.

NORMAN, *Cape*, on the weſt coaſt of Newfoundland iſland, is on the gulf of St Lawrence, and the weſtern entrance of the narrow bay of Mauco, 20 leagues from Cape Ferrol. N. lat. 51 39, W. long. 55 58. High water at full and change days at 9 o'clock.—*Morse.*

NORONHA *Iſland, Ferdinando*, in the S. Pacific Ocean, laid down in lat. 3 56 ſouth, and long. 132 38 weſt. Captain Cook, in his ſecond voyage, looked for it in long. 132 5, but did not find it.—*ib.*

NORRIDGEWALK, or *Norridgewock*, a poſt-town in Lincoln county, on Kennebeck river, Maine, incorporated in 1788, and contains 376 inhabitants. It is 10 miles weſt of Canaan, 239 N. by E. of Boſton, and 587 north-eaſt of Philadelphia. The Indian town of this name ſtood about 40 miles above Fort Halifax, where Kennebeck river, as you aſcend it, after taking a ſouth-weſtward courſe, turns to the northward, and forms a point where the town ſtood. It was deſtroyed by a party under Col. Harman, in 1724.—*ib.*

NORRISTON, the principal town in Montgomery county, Pennſylvania, is about 20 miles N. W. of Philadelphia, on the N. bank of the Schuylkill, having about 20 houſes, a court houſe and jail, and a handſome edifice of ſtone for the preſervation of records, and an obſervatory. This town was the reſidence of that celebrated philoſopher and philanthropiſt, Dr. *David Rittenhouſe.* In his *obſervatory*, near his manſion houſe, he was interred, agreeably to his requeſt, June, 1796. His tomb-ſtone contains nothing but his name and the ſimple record of the days and years of his birth and death. "Here, (ſays the elegant writer of his eulogy, Dr. *Ruſh*) ſhall the philoſophers of future ages reſort to do homage to his tomb, and children yet unborn ſhall point to the dome which covers it, and exultingly ſay, "There lies our *Rittenhouſe.*"—*ib.*

NORTHAMPTON, a large uneven county of Pennſylvania; ſituated in the N. E. corner of the ſtate on Delaware river, which ſeparates it from the ſtate of New Jerſey and New York. It is divided into 27 townſhips, and contains 24,250 inhabitants.—*ib.*

Northampton, a townſhip in Buck's county, Pennſylvania.—*ib.*

Northampton, a town in Northampton county, Pennſylvania, on the S. W. bank of Lehigh river, 5 or 6 miles S. W. of Bethlehem.—*ib.*

Northampton, a county of Halifax diſtrict, North Carolina, bounded north by the ſtate of Virginia, containing 9,981 inhabitants, including 4,409 ſlaves.—*ib.*

Northampton, a maritime county of Virginia, ſituated on the point of the peninſula, which forms the E. ſide of the entrance into Cheſapeak Bay. It has the ocean E. and Accomack county on the north. Its ſouthern extremity is Cape Charles, in lat. 37 11 N. and long. 75 57 W. off which is the ſmall iſland called Smith's Iſland. This county contains 6,889 inhabitants, including 3,244 ſlaves. The lands are low and ſandy.—*ib.*

Northampton *Court Houſe*, in the above county, where a poſt-office is kept, is 40 miles S. by W. of Accomack court houſe, 43 north-eaſt of Norfolk, and 239 ſouth of Philadelphia.—*ib.*

Northampton, a reſpectable poſt town and capital of Hampſhire county, Maſſachuſetts, ſituated within a bend of Connecticut river, on its W. ſide, 40 miles north of Hartford, in Connecticut, and 100 weſt of Boſton. It contains a ſpacious congregational church, a court houſe, jail, and about 250 dwelling houſes, many of which are genteel buildings. Its meadows are extenſive and fertile; and it carries on a conſiderable inland trade. This townſhip was incorporated in 1685, and contains 1,628 inhabitants.—*ib.*

Northampton, a townſhip in Burlington county, New Jerſey, which contains about 56,000 acres, half of which is under improvement, the other half is moſtly pine barren. The chief place of the townſhip is called Mount Holly. It contains about 150 houſes, an Epiſcopal church, a Friend's meeting-houſe, and a market-houſe. It is 22 miles from Trenton, and 20 from Philadelphia.—*ib.*

NORTHBOROUGH, a townſhip in Worceſter county, Maſſachuſetts, formerly the northern part of Weſtborough. It was incorporated in 1760, and contains 619 inhabitants. It is 10 miles E. of Worceſter, and 36 W. of Boſton.—*ib.*

NORTHBRIDGE, a townſhip in Worceſter county, Maſſachuſetts, taken from Uxbridge, which bounds it on the S. It was incorporated in 1772, and contains 569 inhabitants. Blackſtone river runs through this town. It is 12 miles S. by E. of Worceſter, and 45 S. W. of Boſton.—*ib.*

NORTH CAROLINA, one of the United States, is bounded N. by Virginia; E. by the Atlantic Ocean; S. by S. Carolina, and W. by the ſtate of Tenneſſee. It lies between 33 50, and 36 30 N. lat. and between 76 8 and 83 8 W. long. being about 450 miles in length, and 180 in breadth, containing about 34,000 ſquare miles. The diſtricts of this ſtate are claſſed in three diviſions, viz. The *Eaſtern* diſtricts, *Edenton*, *Newbern* and *Wilmington*—the *Middle* diſtricts, *Fayetteville*, *Hillſborough* and *Halifax*—and the *Weſtern* diſtricts, *Morgan* and *Saliſbury*. The eaſtern diſtricts are on the ſea-coaſt, extending from the Virginia line ſouthward to S. Carolina. The five others cover the whole ſtate, W. of the maritime diſtricts; and the greater part of them extend acroſs the ſtate from N. to S. Theſe diſtricts are ſubdivided into 58 counties, which contained, in 1790, 393,751 inhabitants, of whom 100,572 were ſlaves. The chief *rivers* of N. Carolina are Chowan and its branches, Roanoke, Tar, Neus, and Cape Fear or Clarendon. Moſt of theſe and the ſmaller rivers have bars at their mouths; and the coaſt furniſhes no good harbours except Cape Fear. There are two remarkable *ſwamps* in this ſtate, the one in Currituck county, the other on the line between this ſtate and Virginia. The moſt remarkable *ſounds* are Albemarle, Pamlico and Core Sounds—the *capes*, Lookout, Hatteras and Fear. Newbern is the largeſt town in the ſtate; the other towns of note are Edenton, Wilmington, Halifax, Hillſborough, Saliſbury, and Fayetteville; each of which have been, in their turns, the ſeat of the general aſſembly. Raleigh, ſituated near the centre of the ſtate, has lately been eſtabliſhed as the metropolis. N. Carolina, in its whole width, for 60 miles from the ſea, is a dead level. A great proportion of this tract lies in foreſt, and is barren. On the banks of ſome of the rivers, particularly of the Roanoke, the land is fertile and good. Interſperſed through the other parts, are glades of rich ſwamp, and ridges of oak land, of a black, fertile ſoil. Sixty or eighty miles from the ſea, the country riſes into hills and mountains, as in S. Carolina and Georgia. Wheat, rye, barley, oats and flax, grow well in the back hilly country. Indian corn and pulſe of all kinds, in all parts. Cotton and hemp are alſo conſiderably cultivated here, and might be raiſed in much greater plenty. The cotton is planted yearly: the ſtalk dies with the froſt. The labour of one man will produce 1000 pounds in the ſeeds, or 250 fit for manufacturing. A great proportion of the produce of the back country, conſiſting of tobacco, wheat, Indian corn, &c. is carried to market in S. Carolina and Virginia. The ſouthern interior counties carry their produce to Charleſton, and the northern to Peterſburg, in Virginia. The exports from the lower parts of the ſtate, are tar, pitch, turpentine, roſin, Indian corn, boards, ſcantling, ſtaves, ſhingles, furs, tobacco, pork, lard, tallow, bees-wax, myrtle-wax, and a few other articles, amounting in the year, ending September 30th, 1791, to 524,548 dollars. Their trade is chiefly with the Weſt Indies and the northern ſtates. In the flat country near the ſea-coaſt, the inhabitants, during the ſummer and autumn, are ſubject to intermitting fevers, which often prove fatal, as bilious or nervous ſymptoms prevail. The weſtern hilly parts of the ſtate are as healthy as any part of America. That country is fertile, full of ſprings and rivulets of pure water. Autumn is very pleaſant, both in regard to the temperature and ſerenity of the weather, and the richneſs and variety of the vegetable productions, which the ſeaſon affords. The winters are ſo mild in ſome years, that autumn may be ſaid to continue till ſpring. Wheat harveſt is in the beginning of June, and that of Indian corn early in September.

The large natural growth of the plains, in the low country, is almoſt univerſally pitch pine, which is a tall handſome tree, far ſuperior to the pitch pine of the northern ſtates. This tree may be called the ſtaple commodity of N. Carolina. It affords pitch, tar, turpentine, and various kinds of lumber, which, together, conſtitute at leaſt one half of the exports of this ſtate. No country produces finer white and red oak for ſtaves. The ſwamps abound with cypreſs and bay trees. The latter is an evergreen, and is food for the cattle in winter. The miſsletoe is common in the back country. This is a ſhrub, which differs in kind, perhaps, from all others. It never grows out of the earth, but on the tops of trees. The roots (if they may be ſo called) run under the bark of the tree, and incorporate with the wood. It is an evergreen reſembling the garden box-wood. The late war, by which N. Carolina was greatly injured, put a ſtop to ſeveral iron works. There are four or five furnaces in the ſtate, that are in blaſt, and a proportionable number of forges. The weſtern parts of this ſtate, which have been ſettled within the laſt 40 years, are chiefly inhabited by Preſbyterians from Pennſylvania, the deſcendants of people from the north of Ireland, and are exceedingly attached to the doctrines, diſcipline and uſages of the church of Scotland. They are a regular induſtrious people. The Moravians have ſeveral flouriſhing ſettlements in the upper part of this ſtate. The Friends or Quakers have a ſettlement in New-Garden in Guilford county, and ſeveral congregations at Perquimins and Paſquotank. The Methodiſts and Baptiſts are numerous and increaſing. The general aſſembly of N. Carolina, in December 1789, paſſed a law incorporating 40 gentlemen, 5 from each diſtrict, as truſtees of the Univerſity of N. Carolina. The ſtate has given handſome donations for the endowment of this ſeminary. The general aſſembly, in December, 1791, loaned £5,000 to the truſtees, to enable them to proceed immediately with their buildings. There is a very good academy at Warrenton, another at Williamſborough, in Granville, and three or four others in the ſtate, of conſiderable note. North Carolina has had a rapid growth. In the year 1710, it contained but about 1200 fencible men. In 1794, the number was eſtimated at about 50,000. It is now, in point of numbers, the fourth ſtate in the Union. By the conſtitution of this ſtate, which was ratified in December, 1796, all legiſlative authority is veſted in two diſtinct branches, both dependent on the people, viz. a ſenate and houſe of commons, which, when convened for buſineſs, are ſtyled the general aſſembly. The ſenate is compoſed of repreſentatives, one from each county, choſen annually by ballot. The houſe of commons conſiſts of repreſentatives choſen in the ſame way, 2 for each county, and one for each of the towns of Edenton, Newbern, Wilmington, Saliſbury, Hillſborough, Halifax, and Fayetteville. The hiſtory of North Carolina is leſs known than that of any other of the ſtates. From the beſt accounts that hiſtory affords, the firſt permanent ſettlement in North Carolina was made about the year 1710, by a number of Palatines from Germany, who had been reduced to circumſtances of great indigence, by a calamitous war. The infant colony remained under the general government of South Carolina, till about the year 1729, when ſeven of the proprietors, for a valuable conſideration, veſted their property and juriſdiction in the crown; and the colony was erected into a ſeparate province, by the name of North Carolina, and its preſent limits eſtabliſhed by an order of George II.—*ib.*

NORTH CASTLE, a townſhip of New York, in Weſt Cheſter county, north of Mount Pleaſant, and the White Plains on the borders of Connecticut. In 1790, it contained 2,478 inhabitants. In 1796, there were

173 of the inhabitants qualified electors. It is 10 miles from White Plains, and 20 from Ridgefield in Connecticut.—*ib.*

NORTH-EAST, a ſmall river which empties in at the head of Cheſapeak Bay, about five miles below Charleſtown; only noticeable for the quantity of herrings caught in it.—*ib.*

NORTH-EAST-TOWN, a townſhip in Dutcheſs county, New-York, about 90 miles N. of New-York city; between Rhynbeck and Connecticut weſt line. In 1790, it contained 3,401 inhabitants. In 1796, there were in it 391 qualified electors.—*ib.*

NORTH-EDISTO *Inlet*, on the coaſt of S. Carolina, is 11 miles from Stono Inlet, and 3 E. N. E. from South Ediſto.—*ib.*

NORTHFIELD, a townſhip in Orange county, Vermont, between 20 and 30 miles W. of Newbury, in the W. part of the county.—*ib.*

Northfield, a thriving townſhip, in the N. part of Hampſhire county, Maſſachuſetts; ſituated on the E. ſide of Connecticut river, 30 miles N. of Northampton, 100 N. W. by W. of Boſton. It contains 868 inhabitants. The town was incorporated in 1673, and ſome years after deſolated by the Indians. The inhabitants returned again in 1685, but it was ſoon after deſtroyed a ſecond time. In 1713 it was again rebuilt, and one third of the townſhip was taken off, and incorporated by the name of Hinſdale. Fort Dummer was in the vicinity of this town.—*ib.*

Northfield, a ſmall town in Rockingham county, New Hampſhire, taken from Canterbury, on the E. ſide of Merrimack river, and incorporated in 1780. It contains 606 inhabitants.—*ib.*

Northfield, a townſhip in Richmond county, Staten Iſland, New York, containing 1021 inhabitants, including 133 qualified electors, and 133 ſlaves.—*ib.*

NORTH HAMPTON, a townſhip of New Hampſhire, in Rockingham county, which contains 657 inhabitants, taken from Hampton and incorporated in 1742.—*ib.*

NORTH-HAVEN, a townſhip of Connecticut, ſituated in New-Haven county, on the E. ſide of Eaſt river, 8 miles N. by E. of New-Haven, and 32 S. by W. of Hartford. It was ſettled in 1660 by 35 men, principally from Saybrook. This town is the birth-place of that learned, pious and excellent man, Dr Ezra Stiles, late preſident of Yale college.—*ib.*

NORTH-HEMPSTEAD, a townſhip in Queen's county, Long-Iſland, New York, bounded eaſterly by Oyſter Bay, northerly by the ſound, and ſouth by South-Hempſtead. In 1790, it contained 2696 inhabitants, of whom 507 were ſlaves. In 1796, 232 of the inhabitants were qualified electors. The ſoil is but indifferent.—*ib.*

NORTH-HUNTINGTON a townſhip in Weſtmoreland county, Pennſylvania.—*ib.*

NORTH *Iſland*, on the coaſt of S. Carolina, lies on the north ſide of Winyah harbour.—*ib.*

NORTHLINED *Lake*, in N. America, is about 160 miles S. of the head of Cheſterfield Inlet; is full of iſlands, and about 80 miles long, and 25 broad.—*ib.*

NORTH KINGSTOWN, a town in Waſhington county, Rhode Iſland, which carries on a conſiderable trade in the fiſheries, beſides ſome to the Weſt Indies. Its harbour is called Wickford, on the weſt ſide of Narraganſet bay, oppoſite the north end of Canonnicut Iſland. It is about 8 miles north-weſt of Newport, and 20 ſoutherly of Providence. The townſhip contains 2,907 inhabitants.—*ib.*

NORTH MOUNTAIN, one of the ridges of the Allegany Mountains, which extends through Virginia and Pennſylvania. There is a curious ſyphon fountain in Virginia, near the interſection of lord Fairfax's boundary with the North Mountain, not far from Brock's Gap, on the ſtream of which is a griſt mill, which grinds two buſhels of grain at every flood of the ſpring.—*ib.*

NORTHPORT, a townſhip in Hancock county, Diſtrict of Maine, taken from the northerly part of Duck Trap Plantation, and incorporated in 1796.—*ib.*

NORTH REEF, off the iſland of St Domingo, in the Weſt-Indies, lies in lat. 20 33 N. and long. 69 12 W.—*ib.*

NORTH RIVER, in Maſſachuſetts, for its ſize, is remarkable for its depth of water, being in ſome places not more than 40 or 50 feet wide, yet veſſels of 300 tons are built at Pembroke, and deſcend to Maſſachuſetts Bay, 18 miles diſtant, as the river runs. It riſes in Indian Head Pond, in Pembroke, and runs a ſerpentine courſe between Scituate and Marſhfield. The river is navigable for boats to the firſt fall, 5 miles from its ſource. Thence to the neareſt waters which run into Taunton river, is only three miles. A canal to connect the waters of theſe two rivers, which communicate with Narraganſet and Maſſachuſetts bays, would be of great utility, as it would ſave a long and dangerous navigation round Cape Cod.—*ib.*

North River, a very conſiderable river of New Mexico, in North America, which riſes in the north part of it, and directs its courſe to the S. E. and empties into the Gulf of Mexico, at the W. end, in about lat. 26 12 north.—*ib.*

North River, a branch of Fluvanna river, in Virginia.—*ib.*

NORTH SALEM, a townſhip in Weſt Cheſter county, New York, bounded ſoutherly by Salem, eaſterly by Connecticut, northerly by Dutcheſs county, and weſterly by the middle of Croton river. In 1790, it contained 1058 inhabitants, including 58 ſlaves. In 1796, 162 of the inhabitants were qualified electors.—*ib.*

NORTH SOUND POINT is the projecting point of land on the N. E. ſide of the iſland of Antigua, in the Weſt-Indies, and is about S. S. E. from Long Iſland.—*ib.*

NORTHUMBERLAND, a town in Grafton county, New Hampſhire, ſituated on the E. ſide of Connecticut river, at the mouth of the Upper Amonooſuck. It was incorporated in 1779, and contains 117 inhabitants.—*ib.*

Northumberland, a county of Pennſylvania, bounded N. by Lycoming, S. and W. by Dauphin and Mifflin counties. It is divided into 16 townſhips, and in 1790 contained 17,161 inhabitants. The county of Lycoming has ſince the cenſus been lately taken from it; but the county is ſuppoſed to contain nearly as many inhabitants as before; a great number of people having emigrated to this part of the ſtate. Chief town, Sunbury.—*ib.*

Northumberland, a flouriſhing poſt town in the above county, ſituated on the point of land formed by the junction of the E. and W. branches of the Suſquehannah. It is laid out regularly, and contains about 120 houſes, a Preſbyterian church, and an academy. It is 2 miles N. by W. of Sunbury, and 124 N. W. by W. of Philadelphia.—*ib.*

Northumberland, a county of Virginia, bounded E. by Cheſapeak Bay, and W. by Richmond. It contains 9,163 inhabitants, including 4,460 ſlaves. The court-houſe, where a poſt office is kept, is 12 miles from Kinſale, 18 from Lancaſter court-houſe, 86 from Frederickſburg, and 317 from Philadelphia.—*ib.*

NORTH-WALES, a town of Caroline county, Virginia, on Pamunky river, about 2 miles below the junction of N. and S. Anna branches.—*ib.*

NORTH-WEST *River*, a branch of Cape Fear, or Clarendon river, in N. Carolina. It is formed by the junction of Haw and Deep rivers; and it is 300 yards wide at Aſhwood, 80 or 90 miles above the Capes; even when the ſtream is low, and within its banks. On the weſt ſide of this river, about 40 miles above Aſhwood, in the banks of a creek, 5 or 6 feet below the ſandy ſurface, are to be ſeen, projecting out many feet in length, trunks of trees entirely petrified.—*ib.*

NORTHWOOD, an interior and elevated townſhip in Rockingham county, New-Hampſhire, in which, and on its borders, are a number of ſmall ponds, whoſe waters feed Piſcataqua and Suncook rivers. It was incorporated in 1773; contains 744 inhabitants, and is about 39 miles north-weſt of Portſmouth. Cryſtals and cryſtalline ſpars are found here.—*ib.*

NORTH-YARMOUTH, a poſt-town of the Diſtrict of Maine, in Cumberland county, on a ſmall river which falls into Caſco Bay. It is 17 miles W. by S. of Brunſwick, 14 north of Portland, and 140 E. of Boſton. The townſhip is extenſive, was incorporated in 1713, and contains 1,978 inhabitants. Cuſſen's river divides it from Freeport on the N. E.—*ib.*

NORTON, a townſhip in Eſſex county, Vermont, ſituated on the Canada line, having Canaan eaſt, and Holland on the weſt.—*ib.*

Norton, a townſhip of Maſſachuſetts, ſituated in Briſtol county, and 33 miles ſouthward of Boſton. It was incorporated in 1711, and contains 1428 inhabitants. The annual amount of the nail manufacture here is not leſs than 300 tons. There is alſo a manufacture of ochre which is found here, ſimilar to that at Taunton.—*ib.*

Norton, a ſettlement on the north-eaſt coaſt of Cape Breton Iſland.—*ib.*

Norton's *Sound*, on the N. W. coaſt of N. America, extends from Cape Darby on the N. N. W. to Cape Denbigh, or Cape Stephen's on the S. or S. E. N. lat. 64 50.—*ib.*

NORWALK, a pleaſant poſt-town in Fairfield county, Connecticut, ſituated on the north ſide of Long-Iſland Sound. It contains a Congregational and an Epiſcopal church which are neat edifices, and between 40 and 50 compact houſes. It is 13 miles W. by S. of Fairfield, 34 S. W. by W. of New-Haven, 54 N. E. of New York, and 149 from Philadelphia. N. lat. 41 9, W. long. 73 47. The townſhip is ſituated in a fertile wheat country, and was ſettled in 1651. Here are iron-works and a number of mills. It has a ſmall trade to New York and the Weſt-Indies.—*ib.*

NORWAY, a townſhip of New York, in Herkemer county, incorporated in 1792. By the State cenſus of 1796, it contained 2,164 inhabitants, of whom 353 were electors.—*ib.*

Norway, a new townſhip in Cumberland county, Diſtrict of Maine, incorporated 1797.—*ib.*

NORWICH, a conſiderable townſhip in Windſor county, Vermont, on the weſt ſide of Connecticut river, oppoſite to Dartmouth college. It contains 1158 inhabitants.—*ib.*

Norwich, a townſhip in Hampſhire county, Maſſachuſetts, 24 miles S. W. of Northampton, and 114 weſt of Boſton. It was incorporated in 1773, and contains 742 inhabitants.—*ib.*

Norwich, a city and poſt town of Connecticut, and of the ſecond rank in New London county, ſituated at the head of navigation on Thames river, 14 miles north of New London, and 40 S. E. of Hartford. This commercial city has a rich and extenſive back country; and avails itſelf of its happy ſituation on a navigable river, which affords a great number of convenient ſeats for mills, and water machines of all kinds. The inhabitants manufacture paper of all kinds, ſtockings, clocks and watches, chaiſes, buttons, ſtone and earthen ware, oil, chocolate, wire, bells, anchors, and all kinds of forge-work. The city contains about 450 dwelling-houſes, a court houſe, and two churches for Congregationaliſts, and one for Epiſcopalians, and about 3000 inhabitants. The city is in three detached, compact diviſions, viz. Chelſea, at the landing, the Town, and Bean Hill; in the latter diviſion is an academy, and in the town is an endowed ſchool. The courts of law are held alternately at New London and Norwich. This town was ſettled in 1660, by 35 men, principally from Saybrook. It is 251 miles N. E. of Philadelphia. N. lat. 41 34, W. long. 72 29.—*ib.*

Norwich, a townſhip in Tioga county, New York, taken from the towns of Jericho and Union, and incorporated in 1793. It is ſettled principally by people from Connecticut; is bounded ſoutherly by Oxford, and lies 55 miles weſt of Cherry Valley. By the State cenſus of 1796, 129 of its inhabitants were electors.—*ib.*

NOTCH, *The*, a paſs in the weſtern part of the White Mountains, in New-Hampſhire; the narroweſt part of which is but 22 feet wide, between two perpendicular rocks. It is 25 miles from the Upper Coos. From the height above it a brook deſcends, and meanders through a meadow, formerly a beaver pond. It is ſurrounded by rocks, which, on one ſide, are perpendicular, and on the others, riſe in an angle of 45 degrees, a ſtrikingly pictureſque ſcene. This defile was known to the Indians, who formerly led their captives through it to Canada; but it had been forgotten or neglected, till the year 1771, when two hunters paſſed through it. There is a road this way now to the Upper Coos.—*ib.*

Notch, Cape, is the W. point of Goodluck Bay, in the Straits of Magellan. S. lat. 53 33, W. long. 74 34.—*ib.*

NOTTAWAY, a ſmall river of Virginia, which runs E. by S. and reeeives Black Water on the line of N. Carolina; thence purſuing a S. by W. courſe of about 10 miles, it joins the Meherrin; the confluent ſtream then aſſumes the name of Chowan river, and empties into Albemarle Sound.—*ib.*

NOTTAWAY, a county of Virginia, bounded N. and N. W. by Amelia, from which it was taken in the year 1788.—*ib.*

NOTTINGHAM, a townſhip in Rockingham county, New-Hampſhire, 14 miles N. of Exeter, and 25 N. W. of Portſmouth. It was incorporated in 1722, and contains 1068 inhabitants.—*ib.*

NOTTINGHAM, *Weſt*, a townſhip in Hillſborough county, New-Hampſhire, ſituated on the E. ſide of Merrimack river; was incorporated in 1746, and contains 1064 inhabitants. It has Maſſachuſetts line for its ſouthern boundary, which divides it from Dracut, and is about 45 miles N. N. W. of Boſton.—*ib.*

NOTTINGHAM, a townſhip in Cheſter county, Pennſylvania.—*ib.*

NOTTINGHAM, the moſt northern town of Burlington county, New Jerſey, ſituated on the eaſtern bank of Delaware river, between Bordentown and Trenton.—*ib.*

NOTTINGHAM, a town in Prince George's county, Maryland, ſituated on Patuxent river, nearly 16 miles north-eaſterly of Piſcataway and 20 S. E. of the Federal City.—*ib.*

NOXAN, or *Noxonton*, or *Nox-Town*, a town of New-Caſtle county, Delaware, 21 miles north of Dover, and 9 S. by S. W. of St George's town.—*ib.*

NUBLADA, an iſland in the Pacific Ocean, with 3 ſmall ones north of it and near to it, W. by S. of Cape Corientes, on the coaſt of Mexico, and eaſt of Roco Portida. N. lat. 16 40, W. long. 122 30.—*ib.*

NUCHVUNK, a place in New-Britain, the reſort of Walruſſes, in winter; with the teeth of theſe animals the Indians head their darts. Lat. 60 north.—*ib.*

NUEL, or NEWEL, the upright poſt about which ſtairs turn, being that part of the ſtaircaſe which ſuſtains one end of the ſteps.

NUESTRA *Senora de la Paz*, an epiſcopal ſee and town of Peru, in S. America. S. lat. 17 10, W. long. 64.—*Morſe.*

NUESTRA *Senora de la Vittoria*, a town of Mexico. N. lat. 18, W. long. 92 35.—*ib.*

NUEVO *Baxo*, a bank called by the Britiſh the New Bear, being about 32 leagues ſouth of the weſt end of the iſland of Jamaica, in lat. 15 57 north. It has a key, 2 cables length long and 1⅓ broad; ſtretching E. by N. and W. by S. The Britiſh find this a good ſtation in a Spaniſh war, as moſt ſhips come this way from the Spaniſh Main, going to the Havannah.—*ib.*

O.

OACHATE *Harbour*, near the ſouth point of Ulietea, one of the Society Iſlands, in the S. Pacific Ocean, N. W. of Otaheite. S. lat. 16 55, weſt long. 151 24.—*Morſe.*

OAHAHA, a river of Louiſiana, which empties into the Miſſiſſippi from the N. W. in lat. 39 10 north, and 7 miles north of Riviere au Beuf.—*ib.*

OAHOONA, one of the Ingraham Iſles, which is ſaid to be the northernmoſt of all this cluſter. It lies about 10 leagues north-eaſt of Nooheeva. To this iſland Capt. Roberts gave the name of *Maſſachuſetts.* Capt. Ingraham had before called it *Waſhington.*—*ib.*

OAITIPIHA or *Aitepeha Bay*, ſituated near the north-eaſt end of the leſſer peninſula of the iſland of Otaheite, has good anchorage in 12 fathoms. S. lat. 17 46, weſt long. 149 14.—*ib.*

OAK *Bay*, or the *Devil's Head*, in the Bay of Fundy, is 9 leagues S. S. E. of Mooſe Iſland. It is very high land, and may be ſeen at 10 or 12 leagues diſtance.—*ib.*

OAK *Iſland*, a long narrow iſland on the coaſt of N. Carolina, which with Smith's Iſland forms the S. W. channel of Cape Fear river.—*ib.*

OAKHAM, a townſhip in Worceſter county, Maſſachuſetts; 15 miles north-weſt of Worceſter, and 62 weſt of Boſton. It was incorporated in 1762, and contains 772 inhabitants.—*ib.*

OAKMULGEE *River* is the ſouthern great branch of the beautiful Alatamaha, in Georgia. At the Oakmulgee Fields it is about 300 or 400 yards wide. Theſe rich and fertile fields are on the eaſt ſide of the river, above the confluence of the Oconee with this river; theſe two branches are here about 40 miles apart. Here are wonderful remains of the power and grandeur of the ancients of this part of America, conſiſting of the ruins of a capital town and ſettlement, vaſt artificial hills, terraces, &c.—*ib.*

OASIS, (plur. OASES), a fertile ſpot in the midſt of a ſandy deſart. In the SAHARA, or Great Deſart of Africa, there are many *Oaſes* of extreme fertility.

OATARA, a ſmall woody iſland on the ſouth-eaſt of Ulietea Iſland, in the S. Pacific Ocean; between 3 and 4 miles from which to the north-weſt are two other ſmall iſlands in the ſame direction as the reef, of which they are a part.—*Morſe.*

OBED's *River*, in Tenneſſee, runs ſouth-weſterly into Cumberland river 290 miles from its mouth, by the courſe of the ſtream. Thus far Cumberland river is navigable for large veſſels.—*ib.*

OBION, a navigable river of Tenneſſee, which runs ſouth-weſterly into the Miſſiſſippi, 24 miles ſoutherly of Reelfoot rivers. It is 70 yards broad, 17 miles from its mouth.—*ib.*

OBITEREA, an iſland 100 leagues S. of the Society Iſlands. S. lat. 22 40, W. long. 150 50. It contains no good anchorage, and the inhabitants are averſe to the intruſion of ſtrangers.—*ib.*

OBLATE, flatted or ſhortened; as an oblate ſpheroid, having its axis ſhorter than its middle diameter; being formed by the rotation of an ellipſe about the ſhorter axis.

OBLIQUE ASCENSION, is that point of the equinoctial which riſes with the centre of the ſun, or ſtar, or any other point of the heavens, in an oblique ſphere.

Oblique Circle, in the ſtereographic projection, is any circle that is oblique to the plane of projection.

Oblique Deſcenſion, that point of the equinoctial which ſets with the centre of the ſun, or ſtar, or other point of the heavens, in an oblique ſphere.

Oblique Force, or *Percuſſion*, or *Power*, or *Stroke*, is that made in a direction oblique to a body or plane. It is demonſtrated, that the effect of ſuch oblique force, &c. upon the body, is to an equal perpendicular one, as the ſine of the angle of incidence is to radius.

OBLONG spheroid, is that which is formed by an ellipſe revolved about its longer or tranſverſe axis; in contradiſtinction from the *oblate ſpheroid*, or that which is flatted at its poles, being generated by the revolution of the ellipſe about its conjugate or ſhorter axis.

OBSERVATORY, portable. See Astronomy, n° 504, *Encycl.*

OCCIDENT equinoctial, that point of the horizon where the ſun ſets, when he croſſes the equinoctial, or enters the ſign Aries or Libra.

Occident Eſtival, that point of the horizon where the ſun ſets at his entrance into the ſign Cancer, or in our ſummer when the days are longeſt.

Occident Hybernal, that point of the horizon where the ſun ſets at midwinter, when entering the ſign Capricorn.

OCCOA, or *Ocoa*, a bay on the ſouth ſide of the iſland of St Domingo, into which fall the ſmall rivers Sipicepy and Ocoa. It lies eaſt of Neybe or Julienne bay, and is bounded ſouth-eaſtward by Point Salinas, and weſtward by the eaſt point at the mouth of Bya river. Spaniſh ſhips of war anchor in this bay. Point Salinas is 22 leagues weſt of the city of St Domingo. —*Morſe.*

Occoa, a bay near the eaſt end of the iſland of Cuba, in the windward paſſage, about 20 miles eaſt of Guantanamo Bay.—*ib.*

OCCOCHAPPO, or *Bear-Creek*, in the Georgia Weſtern Territory, empties through the S. W. bank of Tenneſſee river, juſt below the muſcle ſhoals. There is a portage of only about 50 miles from this creek to the navigable waters of Mobile river. The mouth of this creek is in the centre of a piece of ground, the diameter of which is 5 miles, ceded by the ſouthern Indians to the United States for the eſtabliſhment of trading poſts.—*ib.*

OCCONEACHEY *Iſlands*, two long narrow iſlands at the head of Roanoke river, in Virginia, juſt below where the Staunton and Dan unite and form that river. —*ib.*

OCONA *Port*, on the coaſt of Peru, on the South Pacific Ocean, is 11 leagues N. W. of Quilca, and a bold coaſt, and 14 leagues S. E. of Attico.—*ib.*

OCONEE, the north main branch of Alatamaha river, Georgia. It is, in many places, 250 yards wide. Its banks abound with oak, aſh, mulberry, hickory, black-walnut, elm, ſaſſafras, &c.—*ib.*

Oconee *Town* lies on the eaſt bank of the river of its name in Georgia; about 26 miles weſt-north-weſt of Golphington, and 62 weſt by north of Auguſta.—*ib.*

OCCOQUAN, a river in Virginia which, after a ſhort courſe, empties into Patowmac river, at High Point, 5 miles below Colcheſter.—*ib.*

OCRECOCK *Inlet*, on the coaſt of N. Carolina, leads into Pamlico Sound, and out of it into Albemarle Sound, through which all veſſels muſt paſs that are bound to Edenton, Waſhington, Bath, or Newbern. It lies in lat. 35 10 N. A bar of hard ſand croſſes the inlet, on which is 14 feet water at low tide. The land on the north is called Ocrecock, that on the ſouth Portſmouth. Six miles within the bar, there is a hard ſand ſhoal which croſſes the channel called the Swaſh. On each ſide of the channel are dangerous ſhoals, ſometimes dry. Few mariners, however well acquainted with the inlet, chooſe to go in without a pilot; as the bar often ſhifts during their abſence on a voyage. It is about 7¼ leagues ſouth-weſt ½ weſt of Cape Hatteras.—*ib.*

OCTANT, the eighth part of a circle.

ODD, in arithmetic, is ſaid of a number that is not even. The ſeries of odd numbers is 1, 3, 5, 7, &c.

ODDLY-odd. A number is ſaid to be oddly-odd, when an odd number meaſures it by an odd number. So 15 is a number oddly-odd, becauſe the odd number 3 meaſures it by the odd number 5.

ODOUR, that quality of certain bodies which excites the ſenſation of ſmell. In the *Annales de Chimie*, Vol. XXI. p. 254, we have a detailed account of certain experiments made by M. Benedict Prevoſt of Geneva, with a view to render the *emanations of odorant bodies perceptible to ſight*. The account is by much too long for a work like ours; eſpecially as we feel not ourſelves inclined to attribute to the experiments all the importance which ſeems to have been allowed to them by the firſt claſs of the French National Inſtitute. We ſhall therefore ſtate only a few of them, which ſeem moſt to favour the author's hypotheſis.

1. A concrete odorant ſubſtance, laid upon a wet glaſs or broad ſaucer, covered with a thin ſtratum of water, immediately cauſes the water to recede, ſo as to form a ſpace of ſeveral inches around it.

2. Fragments of concrete odorant matter, or ſmall morſels of paper or cork, impregnated with an odorant liquor, and wiped, being placed on the ſurface of water, are immediately moved by a very ſwift rotation. Romieu had made this obſervation on camphor, and erroneouſly attributed the effect to electricity. The motion was perceptible even in pieces of camphor of ſeven or eight gros.

3. An odorant liquor being poured on the water, ſtops the motion till it is diſſipated by evaporation. Fixed oil arreſts the motion for a much longer time, and until the pellicle it forms on the water is taken off.

4. When the ſurface of the water is cleaned by a leaf of metal, of paper, or of glaſs, plunged in and withdrawn ſucceſſively until the pellicle is removed, the gyratory motion is renewed. If a piece of red wax or of taper be dipped in water, and the drops ſhaken off into a glaſs of water containing odorant bodies in motion, the movement will be ſtopped. The ſame effect is not produced by metal.

5. A morſel of camphor, plunged to the depth of three or four lines in water, without floating, excites a movement of trepidation in the ſurrounding water, which repels ſmall bodies in its vicinity, and carries

them again to the camphor by ſtarts. The author concludes, that an elaſtic fluid eſcapes from the odorant body in the manner of the fire of a fuſee or the diſcharge of fire-arms.

6. When there is a certain proportion between the height of the water, and that of the ſmall fragment of camphor, the water is briſkly driven off, returns again to the camphor, and again retires, as if by an exploſion, the recoil of which often cauſes the camphor to make part of a revolution on its axis.

7. Camphor evaporates thirty or forty times more ſpeedily when placed upon water, than when entirely ſurrounded with air.

8. Camphor, during the act of diſſipation in the air, preſerves its form and its opaque whiteneſs; upon water it is rounded, and becomes tranſparent as if it had undergone a kind of fuſion. It may be inferred, that this ariſes from the acquired motion, which cauſes it to preſent a greater ſurface to the air.

9. When ſmall pieces of camphor are plunged in water, the camphor becomes rounded and tranſparent, does not acquire any motion, and its diſſipation is leſs perceptible than in the air. The concurrence of air and water is therefore neceſſary to diſengage the fluid which is the cauſe of the motion and total diſſipation of odorant bodies.

10. The motion of odorant bodies upon water decays and ceaſes ſpontaneouſly at the end of a certain time; becauſe the water having then contracted a ſtrong ſmell, the volatilization takes place in all the points of its ſurface; and the ſmall maſs being thus ſurrounded by the odorant fluid, which is no longer air, diſſolves, as in the ordinary odorant fluids, without forming the gaſeous jet which is the cauſe of the motion. The author compares the volatilization of the aromatic ſubſtance to a combuſtion excited by water.

M. Prevoſt hopes, that theſe and other experiments which he explains, will contribute to the theory of odours, which ſo nearly reſembles that of the gaſs. He does not flatter himſelf with having exhauſted this ſubject, but conſiders his diſcoveries as the means of rendering odour perceptible by water, not only to the ſight but even to the touch, as are likewiſe the vibrations of ſonorous bodies. Men deprived of the ſenſe of ſmell, and even the blind, according to him, may in this manner diſtinguiſh odorant bodies from thoſe which have no ſmell. "Perhaps (ſays he) this kind of odoroſcope may, by improvement, become an odorimeter. The exceptions, ſuch for example as that of the cerumen of the ears, which produces much effect on water without being perceptibly odorant, and that of the fingers when hot or moiſt, are merely apparent; for if our ſenſes do not in thoſe caſes diſcover odour, thoſe of animals more powerfully energetic, ſuch as the dog, perceive and diſtinguiſh individuals by its peculiar character. The odoroſcope may afford the information which is wanting reſpecting theſe effluvia. Thus it is that the fat of game, the ſmell of which is nearly to us imperceptible, is very much ſo to dogs, and exhibits ſenſible marks by the odoroſcope."

Profeſſor Venturi of Modena, who heard Prevoſt's memoir read in the National Inſtitute, had himſelf made ſome experiments with camphor kept ſeparately in the air, in the water, and at the ſurface of the water; whence he deduces, that the moſt active virtue for diſſolving camphor reſides at that part where both the air and the water touch the camphor at the ſame time. Hence he explains why, in like circumſtances, camphor evaporates more quickly in a moiſt than in a dry air; and why the Hollanders uſe water in their proceſs for ſubliming this ſubſtance.

It might be thought that the camphor was decompoſed at the ſurface of the water; that the water might ſeize the acidifying part, which renders the camphor concrete; and that the volatile part is diſſipated in the atmoſphere. The author rejects this notion. He thinks that water with camphor floating on its ſurface becomes charged with no more than a very ſmall portion: 1. Becauſe in theſe circumſtances the water acquires the ſame taſte and ſmell of camphor as it obtains when a ſmall quantity of this ſubſtance is kept plunged in the ſame fluid. This water, by expoſure to the air, loſes the qualities with which it had been charged, and becomes inſipid, and without ſmell. 2. Becauſe when the water is ſaturated with all it can take up, the diſſipation of the camphor continues at its ſurface as before. 3. Becauſe the aerial emanations of camphor made at the ſurface of water do themſelves cryſtallize into camphor.

Camphor at the ſurface of the water does nothing, therefore, but diſſolve; and when diſſolved at the ordinary temperature of the atmoſphere, it is not at firſt in the ſtate of vapour, as has been thought. It is ſimply a liquid which extends itſelf over the ſurface of water itſelf; and by this means coming into contact with a great ſurface of air, it is afterwards abſorbed and evaporated. This is proved by the following facts: 1. The ſolution of camphor at the ſurface of water is more rapid in proportion to the extent of the ſurface. In narrow veſſels, the ſection of the column would not be completed in ten days, even though the water might be extremely pure. 2. When the column of camphor has projecting parts, the liquid may be ſeen iſſuing by preference from certain points of the column, covering the ſurface of the water, and driving ſmall floating bodies before it, in the ſame manner as floating bodies go and return in a baſon into which the water of a canal enters with rapidity. 3. If a ſmall piece of camphor, already wetted at one end, be brought near the edge of water contained in a broad ſaucer, and be made to touch the ſaucer itſelf, it depoſits a viſible liquor, which is oily; and by attaching itſelf to the ſaucer, deſtroys the adheſion between the veſſel and the border of the water, ſo that the water retires on account of the affinity of aggregation, which not being oppoſed by the attraction of the ſaucer, cauſes the water to terminate in a round edge. If you remove the piece of camphor, the water will not return to its place until the oily fluid is evaporated. 4. In the ſame manner, when the column of camphor is half immerſed in the water, the oily liquor which iſſues forth deſtroys the adheſion of the water to the column, and produces a ſmall ſurrounding cavity. The ſolution ſtops, or is retarded for a moment, until the fluid, extending itſelf over the water, becomes evaporated: the water then returns to its place, and touches the ſame part of the camphor; the ſolution begins again, and in this manner the proceſs is effected by alternations of contact and apparent repulſion.

Of theſe memoirs by Prevoſt and Venturi, the Engliſh reader will find accurate and full tranſlations in the firſt volume of *Nicholſon's Philoſophical Journal*, together with ſome judicious obſervations on them by the editor, which we ſhall take the liberty to adopt. "The philoſophical conſideration of odorant bodies is ſomewhat obſcured by the old method of generaliſing, or referring the properties of bodies to ſome diſtinct principle or thing ſuppoſed capable of being ſeparated from the body itſelf. Thus the odours of bodies have been ſuppoſed to depend on a ſubſtance imagined in a looſe way to be common to them all and ſeparable from them. Hence the terms, principle of ſmell, ſpiritus rector, and even in the modern nomenclature we find *aroma*. There does not in effect ſeem to be any more reaſon to infer the exiſtence of a common principle of ſmell than of taſte. The ſmell of ammoniac is the action of that gas upon the organ of ſenſe; and this odorant inviſible matter is exhibited to the ſight when combined with an acid gas. But in the ſame manner as ammoniac emanates from water, and leaves moſt part of that fluid behind, ſo will the volatile parts of bodies be moſt eminently productive of this action; and very few, if any, natural bodies will be found which riſe totally. The moſt ſtriking circumſtance in the effect is, that an act of ſuch power ſhould be attended with a loſs by exhalation which is ſcarcely to be appreciated by weight, or in any other method during a ſhort interval of time. But we know ſo little of nervous action, and of other phenomena of electricity, of galvaniſm (ſee GALVANISM in this *Suppl.*) or even of heat, which ſtrongly affect the ſenſes, but elude admeaſurement by gravitation, that the difficulty of weighing the effluvia of odorant bodies becomes leſs aſtoniſhing."

ŒCONOMISTS, a ſect of philoſophers in France, who have made a great noiſe in Europe, and are generally believed to have been unfriendly to religion. The founder of this ſect was a *Dr Duqueſnai*, who had ſo well inſinuated himſelf into the favour of Louis XV. that the king uſed to call him his *thinker*. The ſect was called *œconomiſts*, becauſe the œconomy and order to be introduced into the finances, and other means of alleviating the diſtreſſes of the people, were perpetually in their mouths. The Abbé Barruel admits, that there may have been ſome few of them who directed their ſpeculations to no other object; but he brings very ſufficient proof that the great aim of the majority of the ſect was to eradicate from the minds of the people all reverence for divine revelation.

"Duqueſnai (ſays he) and his adepts had more eſpecially undertaken to perſuade their readers, that the country people, and mechanics in towns, were entirely deſtitute of that kind of inſtruction neceſſary for their profeſſions; that men of this claſs, unable to acquire knowledge by reading, pined away in an ignorance equally fatal to themſelves and to the ſtate; that it was neceſſary to eſtabliſh free ſchools, and particularly throughout the country, where children might be brought up to different trades, and inſtructed in the principles of agriculture. D'Alembert, and the Voltairean adepts, ſoon perceived the advantages they could reap from theſe eſtabliſhments. In union with the œconomiſts, they preſented various memorials to Louis XV. in which not only the temporal but even the ſpiritual advantages of ſuch eſtabliſhments for the people, are ſtrongly urged. The king, who really loved the people, embraced the project with warmth. He opened his mind on the ſubject to Mr Bertin, whom he honoured with his confidence, and had entruſted with his privy purſe;" and it was with great difficulty that this miniſter could convince him of the dangerous deſigns of the ſect.

"Determined (ſays he) to give the king poſitive proof that the œconomiſts impoſed upon him, I ſought to gain the confidence of thoſe pedlars who travel through the country, and expoſe their goods to ſale in the villages, and at the gates of country ſeats. I ſuſpected thoſe in particular who dealt in books to be nothing leſs than the agents of philoſophiſm with the good country folks. In my excurſions into the country I fixed my attention above all on the latter. When they offered me a book to buy, I queſtioned them what might be the books they had? Probably catechiſms or prayer-books? Few others are read in the villages? At theſe words I have ſeen many ſmile. No they anſwered, thoſe are not our works; we make much more money of Voltaire, Diderot and other philoſophic writings. What? ſaid I; the country people buy Voltaire and Diderot? Where do they find the money for ſuch dear works? Their conſtant anſwer was, we have them at a much cheaper rate than prayer-books; we can ſell them at ten ſols (5d.) a volume, and have a pretty profit into the bargain. Queſtioning ſome of them ſtill farther, many of them owned that thoſe books coſt them nothing; that they received whole bales of them without knowing whence they came, but being ſimply deſired to ſell them in their journeys at the loweſt price."

"Louis XV. warned by the diſcovery made by his miniſter, was at length ſatisfied that the eſtabliſhment of theſe ſchools, ſo much urged by the conſpirators, would only be a new inſtrument of ſeduction in their hands. He abandoned the plan; but, perpetually haraſſed by the protecting ſophiſters, he did not ſtrike at the root of the evil, and but feebly impeded its progreſs. The pedlars continued to promote the meaſures of the conſpirators; yet this was but one of the inferior means employed to ſupply the want of their free ſchools, as a new diſcovery brought to light one far more fatal.

"About the middle of the month of September 1789, little more than a fortnight antecedent to the atrocious 5th and 6th of October, at a time when the conduct of the National Aſſembly, having thrown the people into all the horrors of a revolution, indicated that they would ſet no bounds to their pretenſions, Mr Le Roy, lieutenant of the King's Hunt, and an academician, being at dinner at the houſe of Mr D'Angevilliers, intendant of the buildings of his majeſty, the converſation turned on the diſaſters of the revolution, and on thoſe that were too clearly to be foreſeen. Dinner over, the nobleman above mentioned, a friend of Le Roy, hurt at having ſeen him ſo great an admirer of the ſophiſters, reproached him with it in the following expreſſive words: *Well! this, then, is the work of Philoſophy!* Thunderſtruck at theſe words—Alas! cried the academician, *to whom do you ſay ſo? I know it but too well, and I ſhall die of grief and remorſe!* At the word *remorſe*, the ſame nobleman queſtioned him whether he had ſo greatly contributed towards the revolution as to upbraid himſelf with it in that violent manner? 'Yes (anſwered he), I have contributed to it, and far more than I was aware of. I was ſecretary to the committee to which you are indebted for it; but I call heaven to witneſs, that I never thought it would go to ſuch lengths. You have ſeen me in the king's ſervice, and you know that I love his perſon. I little thought of bringing his ſubjects to this pitch, *and I ſhall die of grief and remorſe!'*

"Preſſed to explain what he meant by this committee, this ſecret ſociety, entirely new to the whole company, the academician reſumed: 'This ſociety was a ſort of club that we philoſophers had formed among us, and only admitted into it perſons on whom we could perfectly rely. Our ſittings were regularly held at the Baron D'Holbach's. Left our object ſhould be ſurmiſed, we called ourſelves œconomiſts. We created Voltaire, though abſent, our honorary and perpetual preſident. Our principal members were D'Alembert, Turgot, Condorcet, Diderot, La Harpe, and that Lamoignon, keeper of the ſeals, who on his diſmiſſion ſhot himſelf in his park.'

"The whole of this declaration was accompanied with tears and ſighs; when the adept, deeply penitent, continued: 'The following were our occupations; the moſt of thoſe works which have appeared for this long time paſt againſt religion, morals, and government, were ours, or thoſe of authors devoted to us. They were all compoſed by the members or by the orders of the ſociety. Before they were ſent to the preſs, they were delivered in at our office. There we reviſed and corrected them; added to, or curtailed them, according as circumſtances required. When our philoſophy was too glaring for the times, or for the object of the work we brought it to a lower tint; and when we thought that we might be more daring than the author, we ſpoke more openly. In a word, we made our writers ſay exactly what we pleaſed. Then the work was publiſhed under the title or name we had choſen, the better to hide the hand whence it came. Many ſuppoſed to have been poſthumous works, ſuch as *Chriſtianity Unmaſked*, and divers others *attributed to Freret and Boulanger* after their deaths, were iſſued from our ſociety.

'When we had approved of thoſe works, we began by printing them on fine or ordinary paper, in ſufficient number to pay our expences, and then an immenſe number on the commoneſt paper. Theſe latter we ſent to hawkers and bookſellers free of coſt, or nearly ſo, who were to circulate them among the people at the loweſt rate. Theſe were the means uſed to pervert the people, and bring them to the ſtate you now ſee them in. I ſhall not ſee them long, *for I ſhall die of grief and remorſe!*'

This recital is too well authenticated to be called in queſtion, and too plain to need a commentary. Let it be a warning againſt all ſecret ſocieties, by whatever title of benevolence they may be deſigned by thoſe who form them.

OENEMACK, the ſouth point of Briſtol Bay, on the N. W. coaſt of N. America. N. lat. 54 30, W. long. 160 30.—*Morſe.*

OGEECHEE, a river of Georgia, 18 miles ſouth of Savannah river, and whoſe courſes are nearly parallel with each other. It empties into the ſea oppoſite the north end of Oſſabaw Iſland, 18 miles ſouth of Savannah. Louiſville, Lexington and Georgetown are on the upper part of this river.—*ib.*

OGLETHORPE, a new county on the north ſide of Alatamaha river, weſt of Liberty county. Fort Telfair is in the S. E. corner of this county on the Alatamaha.—*ib.*

OHAMANENO, a ſmall but good harbour, on the W. ſide of Ulietea, one of the Society Iſlands, in the S. Pacific Ocean. S. lat. 16 45, W. long. 151 38. The variation of the compaſs in 1777, was 6 19 E.—*ib.*

OHAMENE *Harbour*, a fine bay on the E. ſide of Otaha, one of the Society Iſlands. It paſſes in by a channel between the two ſmall iſlands Toahoutu, and Whennuaia. Within the reef it forms a good harbour, from 25 to 16 fathoms water, and clear ground.—*ib.*

OHERURUA, a large bay on the S. W. part of the iſland of Otaha, one of the Society Iſlands, and the next harbour to the northward from Apotopoto Bay. There is anchorage from 20 to 25 fathoms, and has the advantage of freſh water. The breach in the reef which opens a paſſage into this harbour, is ¼ of a mile broad, in lat. 16 38 S. and long. 151 30 W.—*ib.*

OHETEROA, one of the Society Iſlands, which is about 12 miles long and 6 broad, inhabited by a people of very large ſtature, who are rather browner than thoſe of the neighbouring iſlands. It has no good harbour nor anchorage. Lat. 22 27 S. long. 150 47.—*ib.*

OHETUNA, a harbour on the S. E. ſide of Ulietea, one of the Society Iſlands.—*ib.*

OHEVAHOA, an iſland in the South Pacific Ocean. S. lat. 9 41, W. long. 139 2.—*ib.*

OHIO, a moſt beautiful river, ſeparates the North Weſtern Territory from Kentucky on the S. and Virginia on the S. E. Its current gentle, waters clear, and boſom ſmooth and unbroken by rocks and rapids, a ſingle inſtance only excepted. It is one quarter of a mile wide at Fort Pitt; 500 yards at the mouth of the Great Kanhaway; 1200 yards at Louiſville, and at the Rapids half a mile, but its general breadth does not exceed 600 yards. In ſome places its width is not 400, and in one place particularly, far below the Rapids, it is leſs than 300. Its breadth, in no one place, exceeds 1200 yards; and at its junction with the Miſſiſſippi, neither river is more than 900 yards wide. Its length, as meaſured according to its meanders by Capt. Hutchins, is as follows:—From Fort Pitt to

Log's Town	18½	Little Miami	126¼
Big Beaver Creek	10¾	Licking Creek	8
Little Beaver Creek	13½	Great Miami	26¾
Yellow Creek	11¾	Big Bones	32½
Two Creeks	21¾	Kentucky	44¼
Long Reach	53¾	Rapids	77¼
End Long Reach	16½	Low Country	155¾
Muſkingum	26½	Buffalo river	64½
Little Kanhaway	12¼	Wabaſh	97¼
Hockhocking	16	Big Cave	42¾
Great Kanhaway	82½	Shawanee river	52½
Guiandot	43¾	Cherokee river	13
Sandy Creek	14½	Maſſac	11
Sioto, or Scioto	48¾	Miſſiſſippi	46
			1188

In common winter and ſpring floods, it affords 30 or 40 feet water to Louiſville; 25 or 30 feet to La Tarte's Rapids; 40 above the mouth of the Great Kanhaway; and a ſufficiency at all times for light batteaux and canoes to Fort Pitt. The Rapids are in lat. 38 8. The inundations of this river begin about the laſt of March, and ſubſide in July, although they frequently happen in other months; ſo that boats which carry 300 barrels of flour from the Monongahela, or Youhiogeny, above Pittſburgh, have ſeldom long to wait for water. During theſe floods, a firſt rate man-of-war may be carried from Louiſville to New Orleans, if the ſudden turns of the river and the ſtrength of its current will admit a ſafe ſteerage. It is the opinion of ſome well informed gentlemen, that a veſſel properly built for the ſea, to draw 12 feet water, when loaded, and carrying from 12 to 1600 barrels of flour, may be more eaſily, cheaply and ſafely navigated from Pittſburg to the ſea, than thoſe now in uſe; and that this matter only requires one man of capacity and enterprize to aſcertain it. A veſſel intended to be rigged as a brigantine, ſnow, or ſhip, ſhould be double-decked, take her maſts on deck, and be rowed to the Ibberville, below which are no iſlands, or to New Orleans, with 20 men, ſo as to afford reliefs of 10 and 10 in the night. Such a veſſel, without the uſe of oars, it is ſuppoſed, would float to New Orleans from Pittſburgh in 20 days. If this be ſo, what agreeable proſpects are preſented to our brethren and fellow-citizens in the weſtern country! The Rapids at Louiſville deſcend about 10 feet in the diſtance of a mile and a half. The bed of the river is a ſolid rock, and is divided by an iſland into two branches, the ſouthern of which is about 200 yards wide, but impaſſable in dry ſeaſons. The bed of the northern branch is worn into channels by the conſtant courſe of the water, and attrition of the pebble ſtones carried on with that, ſo as to be paſſable for batteaux through the greater part of the year. Yet it is thought that the ſouthern arm may be moſt eaſily opened for conſtant navigation. The riſe of the waters in theſe Rapids does not exceed 20 or 25 feet. There is a fort ſituated at the head of the Falls. The ground on the ſouth ſide riſes very gradually. At Fort Pitt the river Ohio loſes its name, branching into the Monongahela and Alleghany.—*ib.*

OHIO, the north-weſternmoſt county of the State of Virginia, bounded eaſt by Waſhington county, in Pennſylvania, and N. W. by the river Ohio, which divides it from the N. W. Territory. It contains 5,212 inhabitants, including 281 ſlaves. Chief town, Liberty.—*ib.*

OHIO *Company's Purchaſe*, in the N. W. Territory, is a tract of excellent land ſituated on the north bank of the Ohio, eaſt of Col. Symes's purchaſe. In this tract there were about 2,500 inhabitants in 1792.—*ib.*

OHIOPE, a ſmall northern tributary ſtream of Alatamaha river, in Oglethorpe county, Georgia.—*ib.*

OHIOPIOMINGO, a tract of land ſo called in the State of Kentucky, ſituated in Nelſon county, on Ohio river, and ſouth weſtward of Salt river.—*ib.*

OHIOPYLE *Falls*, in Youghiogany river, are about 20 feet perpendicular height, where the river is 80 yards wide. They are 30 or 40 miles from the mouth of this river, where it mingles its waters with the Monongahela.—*ib.*

OHITAHOO, an iſland in the S. Pacific Ocean. S. lat. 9 55, W. long. 139 6.—*ib.*

OIL *Creek*, in Alleghany county, Pennſylvania, iſſues from a ſpring, on the top of which floats an oil, ſimilar to that called Barbadoes tar, and empties into Alleghany river. It is found in ſuch quantities, that a man may gather ſeveral gallons in a day. The troops ſent to guard the Weſtern Poſts, halted at this ſpring, collected ſome of the oil, and bathed their joints with it. This gave them great relief from the rheumatic complaints, with which they were afflicted. The waters, of which the troops drank freely, operated as a gentle cathartic.—*ib.*

OIL-MILL, a mill for expreſſing the oils from fruits, or grains, &c. As theſe States do not produce the olive, it would be needleſs to deſcribe the mills which are employed in the ſouthern parts of Europe. We ſhall content ourſelves, therefore, with a deſcription of a Dutch oil mill, employed for grinding and preſſing lintſeed, rape-ſeed, and other oleaginous grains. Farther, to accommodate our deſcription ſtill more to our local circumſtances, we ſhall employ water as the firſt mover; thus avoiding the enormous expence and complication of a windmill.

In Plate XXXVIII. fig. A,

1. Is the elevation of a wheel, over or underſhot, as the ſituation may require.

2. The bell-metal ſocket, ſupported by maſonry, for receiving the outer gudgeon of the water wheel.

3. The water courſe.

Fig. B.

1. A ſpur wheel upon the ſame axis, having 52 teeth.

2. The trundle that is driven by N° 1. and has 78 ſtaves.

3. The *wallower*, or axis for raiſing the peſtles. It is furniſhed round its circumference with *wipers* for lifting the *peſtles*, ſo that each may fall twice during one turn of the water wheel, that is, three *wipers* for each peſtle.

4. A frame of timber, carrying a concave half cylinder of bell-metal, in which the wallower (caſed in that part with iron plates) reſts and turns round. It will be ſeen in profile, fig. G.

5. Maſonry ſupporting the inner gudgeon of the water wheel and the above-mentioned frame.

6. Gudgeon of the wallower, which bears againſt a bell-metal ſtep fixed in the wall. This double ſupport of the wallower is found to be neceſſary in all mills which drive a number of heavy ſtampers.

Fig. C, Is the elevation of the peſtle and preſs frame, their furniture, the mortars, and the preſs-peſtles.

1. The ſix peſtles.

2. Croſs pieces between the two rails of the frame, forming, with theſe rails, guides for the perpendicular motion of the peſtles.

3. The two rails. The back one is not ſeen. They are checked and bolted into the ſtandards N° 12.

4. The tails of the *lifts*, correſponding to the wipers upon the wallower.

5. Another rail in front, for carrying the *detents* which hold up the peſtles when not acting. It is marked 14 in fig. M.

6. A beam a little way behind the peſtles. To this are fixed the pulleys for the ropes which lift and ſtop the peſtles. It is repreſented by 16 in fig. M.

7 The ſaid pulleys with their ropes.

8. The *driver*, which ſtrikes the wedge that preſſes the oil.

9. The *diſcharger*, a ſtamper which ſtrikes upon the inverted wedge, and looſens the preſs.

10. The lower rail with its croſs pieces, forming the lower guides of the peſtles.

11. A ſmall cog wheel upon the wallower, for turning the *ſpatula*, which ſtirs about the oilſeed in the *chauffer-pan*. It has 28 teeth, and is marked N° 6 in fig. M.

12. The four ſtandards, mortiſed below into the *block*, and above into the joiſts and beams of the building.

13. The ſix *mortars* hollowed out of the block itſelf, and in ſhape pretty much like a kitchen pot.

14. The feet of the peſtles, rounded into cylinders, and ſhod with a great lump of iron.

15. A board behind the peſtles, ſtanding on its edge, but inclining a little backwards. There is ſuch another in front, but not repreſented here. Theſe form a ſort of trough, which prevents the ſeed from being ſcattered about by the fall of the peſtles, and loſt.

16. The firſt *preſs-box* (alſo hollowed out of the block), in which the grain is ſqueezed, after it has come for the firſt time from below the milſtones.

17. The ſecond *preſs box*, at the other end of the block, for ſqueezing the grain after it has paſſed a ſecond time under the peſtles.

18. Frame of timber for ſupporting the other end of the wallower, in the ſame manner as at N° 4 fig. B.

19. Small cog wheel on the end of the wallower for giving motion to the mil-ſtones. It has 28 teeth.

20. Gudgeon of the wallower, bearing on a bell metal ſocket fixed in the wall.

21. Veſſels for receiving the oil from the preſs-boxes.

22. Joiſts ſupporting the block.

Fig. D. Elevation and mechaniſm of the milſtones.

1. *Upright ſhaft*, carrying the great cog wheel above, and the *runner milſtones* below in their frame.

2. Cog-wheel of 76 cogs, driven by N° 19. of fig. C.

3. The frame of the *runners*. This will be more diſtinctly underſtood in N° 4. fig H.

4. The innermoſt runner, or the one neareſt the ſhaft.

5. Outermoſt ditto, being farther from the ſhaft.

6. The *inner rake*, which collects the grain under the outer runner.

7. The *outer rake*, which collects the grain under the inner runner. In this manner the grain is always turned over and over, and cruſhed in every direction. The inner rake lays the grain in a ſlope, of which fig. O. is a ſection; the runner flattens it and the ſecond rake lifts it again, as is marked in fig. P; ſo that every ſide of a grain is preſented to the milſtone, and the reſt of the *legger* or *nether milſtone* is ſo ſwept by them, that not a ſingle grain is left on any part of it. The outer rake is alſo furniſhed with a rag of cloth, which rubs againſt the border or hoop that ſurrounds the nether milſtone, ſo as to drag out the few grains which might otherwiſe remain in the corner.

8. The ends of the iron axle which paſſes through the upright ſhaft, and through the two runners. Thus they have two motions: 1*mo*, A rotation round their own axis. 2*do*. That by which they are carried round upon the nether milſtone on which they roll. The holes in theſe milſtones are made a little widiſh; and the holes in the ears of the frame, which carry the ends of the iron axis, are made oval up and down. This great freedom of motion is neceſſary for the runner milſtones, becauſe frequently more or leſs of the grain is below them at a time, and they muſt therefore be at liberty to get over it without ſtraining, and perhaps breaking, the ſhaft

9. The ears of the frame which lead the two extremities of the iron axis. They are mortiſed into the under ſide of the bars of the ſquare frame, that is carried round with the ſhaft.

10. The border or hoop which ſurrounds the nether milſtone.

11. and 12. The nether milſtone and maſonry which ſupports it.

Fig. E. Form of the wallower, ſhewing the diſpoſition of the wipers along its ſurface.

1. Two parts of this ſhaft, which are nicely rounded, and fortified with iron plates, and which reſt upon the bell-metal concaves, which are repreſented in n° 4. of fig. C.

2. The little wheels at each end, for giving motion to the two ſpatulæ, marked n° 11. fig. C.

3. The wipers for the ſecond preſs.

4. The wipers for the firſt preſs.

5. The wipers for the ſix peſtles.

Fig. F. Repreſents the ſurface of the wallower unfolded into a rectangular parallelogram, in order to ſhew the diſtribution of the wipers, and conſequently the ſucceſſion of the ſtrokes given by the different peſtles. This diſtribution has ſomething peculiar. Each peſtle has three wipers; and there are alſo three for the driver and diſcharger of the ſecond preſs. The driver and wiper of the firſt preſs have but one and a half; one for the driver, and the half for the diſcharger; ſo that it ſtrikes twice, and the driver only once, in a turn of the ſhaft. This is the Dutch practice, which differs from that of Flanders. The ſucceſſion of the ſtrokes may be conceived as follows: Reckon the ſtampers, including thoſe of the preſſes, from the water wheel toward the other end of the wallower, and calling them *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *i*, *k*, and ſuppoſing that *a* makes the firſt ſtroke, they proceed in the following order for one turn of the wallower.

ab, d, f, h, c, e, g, ab, d, f, h, c, e, g, ab, d, f, h, c, e, g.

Here it may be obſerved that *a* and *b* ſtrike together. They would do ſo if allowed; but one of them is held up by its detent till the workman ſees proper to diſengage it. Each peſtle, and the driver and diſcharger of the ſecond preſs, make three ſtrokes for one turn of the wallower. But the driver *k* of the firſt preſs makes only one ſtroke in that time, namely, in the interval between the laſt ſtrokes of *e* and *g*. The diſcharger *i* of this preſs makes two ſtrokes; one of them in this ſame interval, and the other along with the firſt ſtroke of *e*. The ſecond preſſing requires a much more violent preſſure than the firſt, becauſe the cake muſt be left perfectly dry and hard.

Fig. G. Profile of the frame of timber which carries the wallower, and greatly contributes to render its motion ſteady.

Fig. H. Is a view of one of the milſtones.

1. The nether milſtones and the maſonry ſupporting the whole.

2. The runner.

3. A ſort of caſe which encloſes the two wings of the milſtone at a very ſmall diſtance from it, in order

to prevent the grain which ſticks to it from being ſcattered. There is another method practiſed at ſome mills.

Fig. I. Repreſents that of Sardamm. AA are two iron rods, about half an inch ſquare, hanging on the axle, on each ſide of the milſtone. Theſe rods are joined by a croſs piece C. which almoſt touches the milſtone. A piece of leather is put between, which rubs upon the milſtone, and clears it of the grain which chances to ſtick to it. N° 4. and 6. repreſent the ears of this frame, by which the end of the iron axle is ſupported, and carried round by the upright ſhaft n° 5.

Fig. K. Plan of the runner milſtones, and the frame which carries them round.

1, 1. Are the two milſtones.

3, 3, 3, 3. The outſide pieces of the frame.

4, 4, 4, 4. The croſs bars of the frame which embrace the upright ſhaft 5, and give motion to the whole.

6, 6. The iron axis upon which the runners turn.

7. The outer rake.

8. The inner ditto.

Fig. L. Repreſents the nether milſtone ſeen from above.

1. The wooden gutter, which ſurrounds the nether milſtone.

2. The border or hoop, about ſix inches high, all round to prevent any ſeed from being ſcattered.

3. An opening or trap door in the gutter, which can be opened or ſhut at pleaſure. When open, it allows the bruiſed grain, collected in and ſhoved along the gutter by the rakes, to paſs through into troughs placed below to receive it.

4. Portion of the circle deſcribed by the outer runner.

5. Portion of the circle deſcribed by the inner one. By theſe we ſee that the two ſtones have different routes round the axis, and bruiſe more ſeed.

6. The outer rake.

7. The inner ditto.

8. The ſweep, making part of the inner rake, occaſionally let down for ſweeping off all the ſeed when it has been ſufficiently bruiſed. The preſſure and action of theſe rakes is adjuſted by means of wooden ſprings, which cannot be eaſily and diſtinctly repreſented by any figure. The oblique poſition of the rakes (the outer point going foremoſt) cauſes them to ſhove the grain inwards or toward the centre, and at the ſame time to turn it over, ſomewhat in the ſame manner as the mould-board of a plough ſhoves the earth to the right hand, and partly turns it over. Some mills have but one ſweeper; and, indeed, there is great variety in the form and conſtruction of this part of the machinery.

Fig. M. Profile of the peſtle frame.

1. Section of the horizontal ſhaft.

2. Three wipers for lifting the peſtles.

3. Little wheel of 28 teeth for giving motion to the ſpatula.

4. Another wheel, which is driven by it, having 20 teeth.

5. Horizontal axle of ditto.

6. Another wheel on the ſame axle having 13 teeth.

7. A wheel upon the upper end of the ſpindle, having 12 teeth.

8. Two guides, in which the ſpindle turns freely, and ſo that it cannot be ſhifted higher and lower.

9. A lever, moveable round the piece n° 14. and having a hole in it at 9, through which the ſpindle paſſes, turning freely. The ſpindle has in this place a ſhoulder which reſts on the border of the hole 9; ſo that by the motion of this lever the ſpindle may be diſengaged from the wheel work at pleaſure. This motion is given to it by means of the lever 10, 10, moveable round its middle. The workman employed at the chauffer pulls at the rope 10, 11, and thus diſengages the ſpindle and ſpatula.

11. A peſtle ſeen ſidewiſe.

12. The *lift* of ditto.

13. The upper rails, marked n° 3. in fig. C.

14. The rail, marked n° 5. in fig. C. To this are fixed the detents which ſerve to ſtop and hold up the peſtles.

15. A detent, which is moved by the rope at its outer end.

16. A bracket behind the peſtles, having a pulley, through which paſſes the rope going to the detent 15.

17. The ſaid pulley.

18. The rope at the workman's hand, paſſing through the pulley 17, and fixed to the end of the detent 15.

This detent naturally hangs perpendicular by its own weight. When the workman wants to ſtop a peſtle, he pulls at the rope 18, during the riſe of the peſtle. When this is at its greateſt height, the detent is horizontal, and prevents the peſtle from falling by means of a pin projecting from the ſide of the peſtle, which reſts upon the detent, the detent itſelf being held in that poſition by hitching the loop of the rope upon a pin at the workman's hand.

19. The two lower rails, marked n° 10. fig. C.

20. *Great* wooden, and ſometimes ſtone, *block*, in which the mortars are formed, marked n° 21 in fig. C.

21. Veſſel placed below the preſs boxes for receiving the oil.

22. Chauffer, or little furnace, for warming the bruiſed grain.

23. Backet in the front of the chauffer, tapering downwards, and opening below in a narrow ſlit. The hair bags in which the grain is to be preſſed after it has been warmed in the chauffer, are filled by placing them in this backet. The grain is lifted out of the chauffer with a ladle, and put into theſe bags; and a good quantity of oil runs from it through the ſlit at the bottom into a veſſel ſet to receive it.

14. The ſpatula attached to the lower end of the ſpindle, and turning round among the grain in the chauffer-pan, and thus preventing it from ſticking to the bottom or ſides, and getting too much heat.

Fig. N. Plan of part of the works.

1, 1. Furnaces for warming the grain.

2, 2. The backets for holding the ſacks while they are a filling.

3, 3. The pan in which the bruiſed grain is heated by the chauffer.

4, 4. A trough for receiving the chips, into which the preſſed oil-cakes are cut, to be afterwards put into the pan and warmed.

5. The preſs-box for the ſecond preſſing.

6. The preſs-box for the firſt preſſing.

7. The ſix mortars.

8. The ſloping boards, to hinder the ſcattering of the oil ſeed.

9. The nether milſtone, but out of its place.

10. Its centre a little higher than the reſt.

11. A rib of wood going round the edge of the nether milſtone, and even with its ſurface, but riſing a

very little outwards, and ſurrounded with a border or hoop about an inch high, to prevent the ſeed from being ſcattered on the ground.

Fig. Q. A ſection, lengthwiſe, of the great block, with the mortars and preſs-boxes.

1. The ſix peſtles.
2. The ſix mortars, each of which has an iron plate at its bottom.
3. The *driving* ſtamper, which falls on the wedge of the firſt preſſing.
4. Ditto, for the ſecond ditto.
5. The *diſcharger*, which ſtrikes on the inverted wedge in order to free the preſs.
6. Ditto, for the ſecond preſſing.
7. Wedge for freeing the preſs.
8. Wedge for preſſing.
9. Wooden *cheeks*, two inches thick, which are placed between the middle wedge and the *ſliding wedges* on each ſide.
10. Preſs-irons, between which are placed the hair-bags containing the bruiſed grain.
11. Iron plate, called the *fountain*, at the bottom, pierced with holes, correſponding with a hole in the block, for allowing the oil to run off from the preſſed grain.
12. Veſſel for receiving ditto.
13. A long iron plate at the bottom of the preſs-box, under the drawing and diſcharging wedges.

Fig. R. Another view of the preſs-irons.

1. The ſide-irons laid flat.
2. The ſame ſeen edgewiſe.
3. The pierced iron plate, upon which the two irons, n° 1. ſtand upright, with the hair-bag between them.
4. One of the hair-bags. It may be obſerved that the ſeams of theſe bags are made on the flat ſides, and not on the edges, where they would be in danger of burſting.
5. A long hair-cloth, in which the bag is wrapped before it is ſet into the preſs. The bag, being filled with bruiſed grain, is placed with its bottom at *a*, and the top at *b*; the part *c a* is lapped over it, reaching to *b*, and then the other end *d* is lapped over that, and reaches to *a*, and the loop at its end ſerves as a handle by which to lift it, and place it properly between the preſs-irons.

Fig. S. The principal pieces of the preſs.

1. The wooden cheeks.
2. The diſcharging wedge.
3. The driving wedge.

4 and 5. The ſliding blocks, which tranſmit the preſſure produced by the driving wedge.

The foregoing enumeration and views of the different parts of a Dutch oil-mill, are ſufficient, we imagine, to enable an intelligent mill-wright, to whom the machine is altogether new, to underſtand its manner of working, and its adaptation to the various parts of the proceſs for extracting the oil from ſeeds or kernels. It would require a very minute deſcription indeed to explain it to a perſon altogether unacquainted with mill-work.

The firſt part of the proceſs is bruiſing the ſeed under the runner ſtones (A). That this may be more expeditiouſly done, one of the runners is ſet about ⅔ds of its own thickneſs nearer the ſhaft than the other. Thus they have different treads; and the grain, which is a little heaped towards the centre, is thus bruiſed by both. The inner rake gathers it up under the outer ſtone into a ridge, of which the ſection is repreſented in Plate XL. fig. O. The ſtone paſſes over it and flattens it. It is gathered up again into a ridge, of the form of fig. P. under the inner ſtone, by the outer rake, which conſiſts of two parts. The outer part preſſes cloſe on the wooden border which ſurrounds the nether ſtone, and ſhoves the ſeed obliquely inwards, while the inner part of this rake gathers up what had ſpread toward the centre. The other rake has a joint near the middle of its length, by which the outer half of it can be raiſed from the nether ſtone, while the inner half continues preſſing on it, and thus ſcrapes off the moiſt paſte. When the ſeed is ſufficiently bruiſed, the miller lets down the outer end of the rake. This immediately gathers the whole paſte, and ſhoves it obliquely outwards to the wooden rim, where it is at laſt brought to a part that is left unboarded, and it falls through into troughs placed to receive it. Theſe troughs have holes in the bottom, through which the oil drips all the time of the operation. This part of the oil is directed into a particular ciſtern, being conſidered as the pureſt of the whole, having been obtained, without preſſure, by the mere breaking of the hull of the ſeed.

In ſome mills this operation is expedited, and a much greater quantity of this beſt oil is obtained, by having the bed of maſonry which ſupports the legger formed into a little furnace, and gently heated. But the utmoſt care is neceſſary to prevent the heat from becoming conſiderable. This, enabling the oil to diſſolve more of the fermentable ſubſtance of the ſeed, expoſes the oil to the riſk of growing ſoon very rancid; and, in general, it is thought a hazardous practice, and the oil does not bring ſo high a price.

When the paſte comes from under the ſtones, it is put into the hair bags, and ſubjected to the firſt preſſing. The oil thus obtained is alſo eſteemed as of the firſt quality, ſcarcely inferior to the former, and is kept apart (The great oil ciſtern being divided into ſeveral portions by partitions).

The oil cakes of this preſſing are taken out of the bags, broken to pieces, and put into the mortars for the firſt *ſtamping*. Here the paſte is again broken down, and the parenchyma of the ſeed reduced to a fine meal. Thus free egreſs is allowed to the oil from every veſicle in which it was contained. But it is now rendered much more clammy, by the forcible mixture of the mucilage, and even of the finer parts of the meal. When ſufficiently pounded, the workman ſtops the peſtle of a mortar, when at the top of its lift, and carries the contents of the mortar to the firſt chauffer pan, where it is heated to about the temperature of melting bees wax (this, we are told, is the teſt), and all the while ſtirred

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(A) We are told, that in a mill at Reichenhoffen in Alſace, a conſiderable improvement has been made by paſſing the ſeed between two ſmall iron rollers, before it is put under the milſtones. A great deal of work is ſaid to be ſaved by this preliminary operation, and finer oil produced, which we think very probable. The ſtamping and preſſing go on as in other mills.

ſtirred about by the ſpatula. From thence it is again put into hair bags, in the manner already deſcribed; and the oil which drips from it during this operation is conſidered as the beſt of the ſecond quality, and in ſome mills is kept apart. The paſte is now ſubjected to the ſecond preſſing, and the oil is that of the ſecond quality.

All this operation of pounding and heating is performed by one workman, who has conſtant employment by taking the four-mortars in ſucceſſion. The putting into the bags and conducting of the preſſing gives equal employment to another workman.

In the mills of Piccardy, Alſace, and moſt of Flanders, the operation ends here; and the produce from the chauffer is increaſed, by putting a ſpoonful or two of water into the pan among the paſte.

But the Dutch take more pains. They add no water to the paſte of this their *firſt ſtamping*. They ſay that this greatly lowers the quality of the oil. The cakes which reſult from this preſſing, and are there ſold as food for cattle, are ſtill fat and ſoftiſh. The Dutch break them down, and ſubject them to the peſtles for the *ſecond ſtamping*. Theſe reduce them to an impalpable paſte, ſtiff like clay. It is lifted out, and put into the *ſecond* chauffer pan; a few ſpoonfuls of water are added, and the whole kept for ſome time as hot as boiling water, and carefully ſtirred all the while. From thence it is lifted into the hair bags of the laſt preſs, ſubjected to the preſs; and a quantity of oil, of the loweſt quality, is obtained, ſufficient for giving a ſatisfactory profit to the miller. The cake is now perfectly dry, and hard, like a piece of board, and is ſold to the farmers. Nay, there are ſmall mills in Holland, which have no other employment than extracting the oil from the cakes which they purchaſe from the French and Brabanters; a clear indication of the ſuperiority of the Dutch practice.

The nicety with which that induſtrious people conduct all their buſineſs is remarkable in this manufacture.

In their oil ciſtern, the parenchymous part, which unavoidably gets through, in ſome degree, in every operation, gradually ſubſides, and the liquor, in any diviſion of the ciſtern, comes to conſiſt of ſtrata of different degrees of purity. The pumps which lift it out of each diviſion are in pairs; one takes it up from the very bottom, and the other only from half depth. The laſt only is barrelled up for the market, and the other goes into a deep and narrow ciſtern, where the dreg again ſubſides, and more pure oil of that quality is obtained. By ſuch careful and judicious practices, the Dutch not only ſupply themſelves with this important article, but annually ſend conſiderable quantities into the very provinces of France and Flanders where they bought the ſeed from which it was extracted. When we reflect on the high price of labour in Holland, on the want of timber for machinery, on the expenſe of building in that country, and on the enormous expenſe of wind mill machinery, both in the firſt erection and the ſubſequent wear and tear, it muſt be evident, that oil mills erected in this country on water falls, and after the Dutch manner, cannot fail of being a great national advantage. The chatellanie or ſeigneurie of Lille alone makes annually between 30,000 and 40,000 barrels, each containing about 26 gallons.

What is here delivered is only a ſketch. Every perſon acquainted with machinery will underſtand the general movements and operations. But the intelligent mechanic well knows, that operations of this kind have many minute circumſtances which cannot be deſcribed, and which, nevertheleſs, may have a great influence on the whole. The rakes in the bruiſing-mill have an office to perform which reſembles that of the hand, directed by a careful eye and unceaſing attention. Words cannot communicate a clear notion of this; and a mill, conſtructed from the beſt drawings, by the moſt ſkilful workman, may gather the ſeed ſo ill, that the half of it ſhall not be bruiſed after many rounds of the machinery. This produces a ſcanty return of the fineſt oil; and the mill gets a bad character. The proprietor loſes his money, is diſcouraged, and gives up the work.—There is no ſecurity but by procuring a Dutch millwright, and giving him a liberal compenſation. Such unhoped-for taſks have been performed of late years by machinery; and mechanical knowledge and *invention* is now ſo generally diffuſed, that it is highly probable that we ſhould ſoon excel our teachers in this branch. But this very diffuſion of knowledge, by encouraging ſpeculation among the artiſts, makes it a ſtill greater riſk to erect a Dutch oil-mill without having a Dutchman, acquainted with its moſt improved preſent form, to conduct the work. We do our duty in giving this counſel.

OISTINS *Bay*, is near the ſouthern extremity of the iſland of Barbadoes, in the Weſt-Indies. It is formed to the S. E. by Kendal's Point. The bay is well defended by forts. The town of Oiſtins ſtands on this bay.—*Morſe*.

OKU JESSO. See SEGALIEN in this *Suppl.*

OLD CAPE FRANCOIS forms the N. point of Ecoſſoiſe or Coſbeck Bay, on the N. E. part of the iſland of St Domingo. All the French ſhips coming from Europe or the Windward iſlands, and bound to the north or weſt part of St Domingo Iſland, are obliged to come in ſight of the Cape Samana, (near 27 leagues ſouth-eaſt by eaſt of this cape) or at leaſt of Old Cape Francois, on account of the dangers of ſhoals to the eaſt. It is about 5 leagues eaſt of Cape de la Roche. N. lat. 19 40 30, W. long. from Paris 72 22.—*Morſe*.

OLD FORT *Bay* is ſituated at the ſouth end of the iſland of St Lucia, in the Weſt-Indies, having St Mary's Iſland and Bay to the eaſt.—*ib.*

OLD FORT *Iſlands*, in Eſquimaux Bay, on the coaſt of Labrador, in N. America. N. lat. 51 24, W. long. 57 48.—*ib.*

OLD *Harbour*, on the ſouth coaſt of the iſland of Jamaica in the Weſt-Indies, is to the weſtward of Port Royal. There are a number of ſhoals and iſlands in the entrance to it. Under ſome of them there is ſafe riding, in from 6 to 8 fathoms.—*ib.*

OLD MAN's *Creek*, in New Jerſey, empties into Delaware river, about 4 miles below Penn's Neck, and ſeparates the counties of Salem and Glouceſter.—*ib.*

OLD MEN's *Port* lies northward of Lima river in Peru, 8 or 9 miles N. of Cadavayllo river.—*ib.*

OLD ROAD, a town and harbour in the iſland of Antigua in the Weſt-Indies.—*ib.*

OLD ROAD *Bay*, on the S. W. coaſt of the iſland of St Chriſtopher's in the Weſt-Indies, between Church Gut W. and Bloody Point E. There is from 5 to 15 fathoms near the ſhore, and the leaſt towards the fort.—*ib.*

Old Road *Town*, on this bay, lies between Eaſt and Black rivers, and is a port of entry.—*ib.*

OLD TOWN, in the State of New York, is ſituated on Staten Iſland, 3 miles S. W. of Newtown, and 12 ſouth-weſterly of New York city.—*ib.*

Old Town, a ſmall poſt town of Maryland, ſituated in Alleghany county, in lat. 39 30, on the N. bank of Patowmac river, and W. ſide of Saw Mill Run; 14 miles S. E. of Cumberland, 142 W. by N. of Baltimore, and 213 from Philadelphia.—*ib.*

Old Town, in N. Carolina, near Brunſwick.—*ib.*

Old Town, a ſmall town of Georgia, lying on the Ogeechee river, 85 miles N. W. by W. of Savannah. —*ib.*

OLEOUT, a ſmall creek which empties into the eaſt branch of Suſquehannah, 5 miles N. E. of the mouth of Unadilla river.—*ib.*

OLINDA, the chief town of the captainſhip of Pernambuco, in Brazil, S. America. It is ſometimes called *Pernambuco*, and has a good harbour ſituated north of Cape St Auguſtine, and ſouth of Paraibo. It was taken by the Dutch in 1630, but was retaken by the Portugueſe. S. lat. 8 13, W. long. 35 5.—*ib.*

OLLEROS, *Point*, on the coaſt of Peru, is 6 leagues S. E. of Quemada Morro, or Headland, and as far N. N. W. of Porto Cavallo. It is little frequented on account of want of trade, although it is a good harbour in caſe of ſqualls from the mountains, or of ſtrong currents ſetting down from the ſea.—*ib.*

OMAGUAS, a tribe of Indians inhabiting the banks of the river Amazon, and converted to Chriſtianity in the year 1686, by father Fritz, a Spaniſh miſſionary. They flat the hind and fore part of the heads of their children, which gives them a monſtrous appearance. They make a jeſt of other nations, calling them calabaſh heads.—*ib.*

OMARA, a river on the coaſt of Brazil, whoſe mouth is in lat. 5 0 S. and long. 36 0 W.—*ib.*

OMASUOS, a juriſdiction in the dioceſe of La Paz, in Peru, It begins almoſt at the gates of the city of La Paz, and extends 20 leagues, being bounded on the weſt by the famous lake of Titi Caca. The air of this juriſdiction is ſomewhat cold, ſo that it produces little grain; but has numerous flocks of cattle fed in its paſtures; there is beſides, a very advantageous trade carried on in another juriſdiction by the Indians living on the borders of the lake, who are remarkably induſtrious in improving that advantage.—*ib.*

OMEE, a corrupt name for *The Miami of the Lake.* The Miami towns on its banks are called the Omee towns, or Au-Mi, by the French Americans, as a contraction of Au Miami.—*ib.*

OMEE-TOWN, one of the Miami towns, ſituated on a pleaſant point formed by the junction of the rivers Miami and St Joſeph. This town ſtood on the E. bank of the latter, oppoſite the mouth of St Mary's river, and was deſtroyed in Gen. Harmar's expedition, in 1790.—*ib.*

OMOAH, a ſmall fortified town in the Spaniſh Main, at the bottom of the bay of Honduras, on the S. ſide, and is within a gulf to the eaſtward of Dolce Gulf, into which the river of its name comes in from the ſouthward. It has a good harbour, which is open to the N. W. in which ſhips of any burden may ride in perfect ſafety. The Britiſh admiral, Parker, in conjunction with the people of Honduras, reduced the ſtrong fort, which is ſituated on the E. ſide of the river, in 1779. The ſpoil was immenſe, being valued at 3 millions of dollars. The Spaniards in vain offered 300,000 dollars as a ranſom for 250 quintals of quickſilver; a commodity indiſpenſably neceſſary in working their gold and ſilver mines.—*ib.*

OMPHALOPTER, or Omphaloptic, in optics, a glaſs that is convex on both ſides, popularly called a *convex lens*.

OMPOMPANOOSUCK, a ſhort, rapid river of Vermont, which empties into the Connecticut at Norwich, oppoſite to Dartmouth College. Its courſe is S. E. its breadth not more than 40 or 50 yards.—*ib.*

ONATIAYO, or *Oneatoyo*, an iſland in the S. Pacific Ocean. S. lat. 9 58, W. long. 138 51.—*ib.*

ONEEHOW, one of the Sandwich Iſlands, in the N. Pacific Ocean, called alſo *Neeheeheow*, about 5 or 6 leagues to the weſtward of Atooi. There is anchorage all along the coaſt of the iſland. It produces plenty of yams, and a ſweet root called tee. N. lat. 21 50, W. long. 160 15.—*ib.*

ONEIDA, one of the Six Nations of Indians, containing 628 ſouls, who inhabit the country S. of Oneida Lake, called the Oneida Reſervation. Their principal village, Kahnonwolohale, is about 20 miles S. W. of Whiteſtown. Theſe Indians, for a number of years paſt, have been under the paſtoral care of the Reverend Mr Kirkland, who with the Reverend Mr Sarjeant, have been chiefly ſupported in their miſſion, by the ſociety eſtabliſhed in Scotland for promoting Chriſtian knowledge. This nation receive an annuity from the State of New York of 3552 dollars, for lands purchaſed of them in 1795, and an annuity of about 628 dollars from the United States. Theſe annuities, (which operate as a diſcouragement to induſtry) together with the corn, beans and potatoes raiſed by the ſquaws, and the fiſh and game, caught by the men, afford them a barely tolerable ſubſiſtence. They are a proud nation, and affect to deſpiſe their neighbours, the Stockbridge and Brotherton Indians, for their attention to agriculture; but they already begin to feel their dependence on them, and are under a neceſſity of purchaſing proviſions of them. The nation is divided into three tribes, or clans, by the names of the *Wolf*, the *Bear*, and the *Turtle*. They have their name from their Pagan Deity, which ſome few of the nation ſtill worſhip, and which is nothing more than a miſhapen, rude, cylindrical *ſtone*, of about 120 pounds weight, in their language called *Oneida*, which ſignifies the *Upright Stone*. Formerly this ſtone was placed in the crotch of a tree, and then the nation ſuppoſed themſelves invincible. Theſe Indians are all of mixed blood; there has not been a *pure* Oneida for ſeveral years paſt.—*ib.*

Oneida *Lake* is about 20 miles W. of Old Fort Stanwix, now called Rome, State of New York, and is between 20 and 30 miles long, and narrow. It is connected with Lake Ontario on the W. by Oſwego river, and with Fort Stanwix by Wood Creek.—*ib.*

ONEMACK *Point* is the ſouth-weſt point of the continent of N. America, on the N. W. coaſt, and the ſouth limit of Briſtol Bay. It is 82 leagues S. S. W. of Cape Newenham, or the north point of that extenſive bay; and in lat. 54 30 north, and long. 163 30 weſt.—*ib.*

O-NIMAMOU, a harbour on the S. E. coaſt of

Ulietea, one of the Society Iſlands, in the S. Pacific Ocean. It is north-eaſt of Ohetuna Harbour, on the ſame coaſt.—*ib.*

ONION, *Cape*, on the ſouth-weſt ſide of Newfoundland Iſland, is about four leagues weſt of Quirpon Iſland, or the northern point of that extenſive iſland. —*ib.*

Onion *River*, in the State of Vermont, formerly called *French River*, and by the Indians *Winooſki*, riſes in Cabot, about 14 miles to the weſt of Connecticut river, and is navigable for ſmall veſſels 5 miles from its mouth, in Lake Champlain, between the towns of Burlington and Colcheſter; and for boats between its ſeveral falls. It is one of the fineſt ſtreams in Vermont, and runs through a moſt fertile country, the produce of which for ſeveral miles on each ſide of the river, is brought down to the lake at Burlington. It is from 20 to 30 rods wide, 40 miles from its mouth, and its deſcent in that diſtance is 172 feet, which is about 4 feet to the mile. Between Burlington and Colcheſter this river has worn through a ſolid rock of lime-ſtone, which in ſome time of remote antiquity muſt have formed at this place a prodigious cataract. The chaſm is between 70 and 80 feet in depth at low water, and in one place 70 feet from rock to rock, where a wooden bridge is thrown acroſs. At Bolton there is a chaſm of the ſame kind, but ſomewhat wider, and the rock is at leaſt 130 feet in height. From one ſide ſeveral rocks have fallen acroſs the river, in ſuch a manner as to form a natural bridge at low water, but in a ſituation to be an object of curioſity only. It was along this river that the Indians formerly travelled from Canada, when they made their attacks on the frontier ſettlements on Connecticut river.—*ib.*

ONONDAGO *Caſtle*, on the Onondago Reſervation Lands in the State of New York, is 25 miles ſouth weſt of Oneida Caſtle.—*ib.*

Onondago, or *Salt Lake*, in the State of New York, is about 5 miles long and a mile broad, and ſends its waters to Seneca river. The waters of the Salt ſprings here are capable of producing immenſe quantities of ſalt. One perſon near the lake boiled down at the rate of 50 buſhels a week, in the year 1792, which he ſold for five ſhillings a buſhel; but any quantity may be made, and at a leſs price. Theſe ſprings are in the State reſervation, and are a great benefit to the country, every part of which is ſo united by lakes and rivers as to render the ſupply of this bulky and neceſſary article very eaſy.—*ib.*

Onondago, a river of New York, which riſes in the Oneida Lake, and runs weſtwardly into Lake Ontario at Oſwego. It is boatable from its mouth to the head of the lake, 74 miles, except a fall which occaſions a portage of 20 yards, thence batteaux go up Wood-Creek almoſt to Fort Stanwix, 40 miles, whence there is a portage of a mile to Mohawk river. Toward the head of this river, ſalmon are caught in great numbers. —*ib.*

Onondago, a county of New York State, conſiſting of military lands divided into 11 townſhips, viz. Homer, Pompey, Manlius, Lyſander, Marcellus, Ulyſſes, Milton, Scipio, Aurelius, Ovid, and Romulus. The county is bounded weſterly by Ontario county, and northerly by Lake Ontario, the Onondago river, and Oneida Lake. The county courts are held in the village of Aurora, in the townſhip of Scipio. This county is admirably ſituated for inland navigation, being interſected by the two navigable rivers Seneca and Oſwego, having beſides 5 lakes and a number of creeks. There were 1323 of the inhabitants qualified to be electors in 1796, as appears by the State cenſus.—*ib.*

Onondago, formerly the chief town of the Six Nations, ſituated in a very pleaſant and fruitful country, and conſiſted of five ſmall towns or villages, about 30 miles S. W. of Whiteſtown.—*ib.*

ONONDAGOES, a tribe of Indians who live near Onondago Lake. About 20 years ſince they could furniſh 260 warriors. In 1779 a regiment of men was ſent from Albany, by Gen. I. Clinton, who ſurprized the town of this tribe, took 33 priſoners, killed 12 or 14, and returned without the loſs of a man. A part of the Indians were then ravaging the American frontiers. This nation, which now conſiſts of 450 ſouls, receives annually from the ſtate of New York, 2,000 dollars; and from the United States about 450 dollars.—*ib.*

ONISCUS (See *Encycl.*). Two new ſpecies of this genus of inſects were diſcovered by *La Martiniere*, the naturaliſt who accompanied Perouſe on his laſt voyage of diſcovery. For the information of ſuch of our readers as are entomologiſts, we ſhall give the author's deſcription of theſe ſpecies. Of the firſt, which he ſays only *nearly* anſwers to the *generic* character of oniſcus, E (fig. 1.) is a view of the upper part of its body, and at F of the lower. Its body is cruſtaceous, and of an opaque white, with two round ruſt-coloured ſpots on the anterior part of its corſlet; two others, much larger, in the form of a creſcent, are on the *elytræ*; its ſhield is alſo of the ſame colour. The under part of the thorax is furniſhed with four pair of legs: the firſt and third of which are terminated with ſharp claws; the ſecond, from its form, ſerves it to ſwim with; the fourth is very ſmall, conſiſting of two membranaceous threads. Some ſcales, alſo membranaceous and very channelled, may alſo perform the office of legs: of theſe the two lower are the largeſt. Its belly is filled with vermicular inteſtines of the ſize of a hair; its mouth is placed between the firſt and ſecond pair of legs, and is of the form of a ſmall trunk placed between two lips, joined only at the upper extremity.

Plate XXXII.

Fig. 2. repreſents an inſect of the genus *oniſcus Linn.* Its body is nearly of the form, conſiſtence, and colour, of the *oniſcus aſellus*, except that it is not divided by ſegments as this laſt is. It has a double tail, three times as long as the body; from the inſertion of which, at the hinder part of the body, ſpring two legs, uſed chiefly by the animal in ſwimming upon its back. The inſect, viewed on the lower part H, preſents ſix pair of legs; the two firſt of which terminate in very ſharp and thick points; it makes uſe of the third to ſwim with, and to balance its body, together with that pair which is inſerted at the baſe of the tail; the fourth pair, and the largeſt of all, is armed with two very ſharp points, which the animal forces into the body of any fiſh on which it ſeizes; the two laſt pair are nothing more than very finely divided membranes. Between the two firſt is ſituated its trunk, ſmooth, and about half a line long; at the baſe of the third pair are two points, of a horney conſiſtence, very hard, and firmly fixed. The two horns alſo below the large pair of legs are, in like manner, very firmly united to its body.

Martiniere imagines it to be by means of theſe darts that it pierces the body of the fiſh on which it is found, and that then, changing its ſituation, it finds means to introduce its trunk into the holes thus formed. When put into a glaſs it ſinks to the bottom, and riſes again to the ſurface with the greateſt eaſe, advancing with the edge of its body, and deſcribing curves. Its two long tails are very eaſily pulled off, without the animal appearing to ſuffer any pain.

ONSLOW, a maritime county of Wilmington diſtrict, N. Carolina, W. of Cape Lookout. It contains 5,387 inhabitants, including 1748 ſlaves. Chief town, Swanſborough.—*Morse.*

Onslow, a townſhip of Nova Scotia, Halifax county, at the head of the Baſin of Minas, 35 miles N. E. of Windſor, and 46 N. by W. of Halifax. It was ſettled by emigrants from New England.—*ib.*

ONTARIO, one of that grand chain of lakes which divide the United States from Upper Canada. It is ſituated between lat. 43 15 and 44 N. and long. 76 30 and 80 W. Its form is nearly elliptical; its greateſt length is from S. W. to N. E. and its circumference about 600 miles. The diviſion line between the State of New York and Canada, on the N. paſſes through this lake, and leaves within the United States 2,390,000 acres of the water of Lake Ontario, according to the calculation of Mr Hutchins. It abounds with fiſh of an excellent flavour, among which are the Oſwego baſs, weighing 3 or 4 lbs. Its banks in many places are ſteep, and the ſouthern ſhore is covered principally with beech trees, and the lands appear good. It communicates with Lake Erie by the river Niagara. It receives the waters of Geneſſee river from the S. and of Onondago, at Fort Oſwego, from the S. E. by which it communicates through Oneida Lake, and Wood Creek, with the Mohawk river. On the N. E. this lake diſcharges itſelf into the river Cataraqui, (which at Montreal takes the name of St Lawrence) into the Atlantic Ocean. It is aſſerted that theſe lakes fill once in 7 years; but the fact is doubted. The iſlands are all at the eaſtern end, the chief of which are Wolf, Amherſt, Gage, and Howe Iſlands.—*ib.*

Ontario, a large, fertile county of New York, comprehending the Geneſſee country, and bounded N. by the lake of its name. It is well watered by Genneſſee river, its tributaries, and a number of ſmall lakes. Here are 8 townſhips, viz. Geneſſee, Erwine, Jeruſalem, Williamſburg, Toulon, Seneca, Bloomfield, and Canadaqua, or Kanandaigua, which laſt is the chief town, ſituated at the N. W. corner of Canandarqua Lake, 15 miles W. of Geneva, and 30 N. E. of Williamſburg. This county was taken from Montgomery in 1789, and in 1790, contained 1,075 inhabitants, including 11 ſlaves. Such has been the emigration to this county, that there were, in 1796, 1258 of the inhabitants who were qualified to be electors.—*ib.*

ONZAN, a cape or point on the north coaſt of Brazil, oppoſite to cape St Lawrence, forming together the points of Laguariba river; the latter cape being on the weſt ſide of the river. The river is 10 leagues S. E. by E. of Bohia Baxa.—*ib.*

OONALASHKA, one of the iſlands of the northern Archipelago, on the N. W. coaſt of America, the natives of which have the appearance of being a very peaceable people, being much poliſhed by the Ruſſians, who alſo keep them in ſubjection. There is a channel between this and the land to the north, about a mile broad, in which are ſoundings from 40 to 27 fathoms. N. lat. 53 55, W. long. 166 31.—*ib.*

OPAQUE, not tranſlucent, nor tranſparent, or not admitting a free paſſage to the rays of light.

OPARO or Oparro, the name given by Captain Vancouver to a ſmall iſland which he diſcovered in latitude 27° 36′ ſouth, and in longitude 215° 49′ eaſt from Greenwich. It was eſtimated at about 6½ miles in length, and no other land was in ſight. Its principal character is a cluſter of high craggy mountains, forming, in ſeveral places, moſt romantic pinnacles, with perpendicular cliffs nearly from their ſummits to the ſea: the vacancies between the mountains would more properly be termed chaſms than valleys. The tops of ſix of the higheſt hills bore the appearance of fortified places, reſembling redoubts; having a ſort of block-houſe, in the ſhape of an Engliſh glaſs-houſe, in the centre of each, with rows of paliſadoes a conſiderable way down the ſides of the hills, nearly at equal diſtances. Theſe overhanging, ſeemed intended for advanced works, and apparently capable of defending the citadel by a few againſt a numerous hoſt of aſſailants. On all of them people were noticed as if on duty, conſtantly moving about. What we conſidered (ſays the author) as block-houſes, from their great ſimiliarity in appearance to that ſort of building, were ſufficiently large to lodge a conſiderable number of perſons, and were the only habitations we ſaw. Yet, from the number of canoes that in ſo ſhort a time aſſembled round the Engliſh ſhip, it is natural to conclude, that the inhabitants are very frequently afloat; and to infer, that the ſhores, and not thoſe fortified hills which appeared to be in the centre of the iſland, would be preferred for their general reſidence.

Whether the fortified places here deſcribed were intended for defences of the iſlanders againſt each other, or againſt attacks from ſome more powerful neighbours, could only be conjectured; but the latter idea ſeems the moſt probable. From the language of the people, and their reſemblance to the Friendly iſlanders, Captain Vancouver conſiders them all as having ſprung from the ſame original ſtock. The people of Oparo, however, are diſtinguiſhed by two circumſtances, certainly in their favour. Not one of them was tattowed; and though they appeared not to have ever ſeen a European before, they all ſeemed perfectly well acquainted with the uſes to which they could apply iron, and preferred articles of it to looking-glaſſes, beads, and other trinkets, with which ſavages are uſually delighted. Though there appeared to be anchoring ground near the north weſt end of the iſland, circumſtances rendered it inconvenient for Captain Vancouver to land on it; ſo that we are yet in a great meaſure ſtrangers to the diſpoſitions of the people, though they appeared to be hoſpitable.

OPECKON *Creek*, in Virginia, a ſouth-weſt water of Potowmac river.—*Morse.*

OPEN Flank, in fortification, is that part of the flank which is covered by the orillon or ſhoulder.

OPENING *of the Trenches*, is the firſt breaking of ground by the beſiegers, in order to carry on their approaches towards a place.

OPERA Glass, is a diagonal perſpective, of which the following conciſe and perſpicuous deſcription is taken

ken from Dr Hutton's Mathematical Dictionary.—ABCD (Plate XLI.) repreſents a tube about four inches long; in each ſide of which there is a hole EF and GH, exactly againſt the middle of a plane mirror IK, which reflects the rays falling upon it to the convex glaſs LM; through which they are refracted to the concave eye-glaſs NO, whence they emerge parallel to the eye at the hole *r s*, in the end of the tube. Let P *a* Q be an object to be viewed, from which proceed the rays P *c*, *a b*, and Q *d*: theſe rays, being reflected by the plane mirror IK, will ſhew the object in the direction *c p*, *ba*, *d q*, in the image *p q*, equal to the object PQ, and as far behind the mirror as the object is before it: the mirror being placed ſo as to make an angle of 45 degrees with the ſides of the tube. And as, in viewing near objects, it is not neceſſary to magnify them, the focal diſtances of both the glaſſes may be nearly equal; or, if that of LM be three inches, and that of NO one inch, the diſtance between them will be but two inches, and the object will be magnified three times, being ſufficient for the purpoſes to which this glaſs is applied.

When the object is very near, as XY, it is viewed through a hole *x y*, at the other end of the tube AB, without an eye-glaſs; the upper part of the mirror being poliſhed for that purpoſe as well as the under. The tube unſcrews near the object-glaſs L M, for taking out and cleanſing the glaſſes and mirror. The poſition of the object will be erect through the concave eye-glaſs.

The peculiar artifice of this glaſs is to view a perſon at a ſmall diſtance, ſo that no one ſhall know who is obſerved; for the inſtrument points to a different object from that which is viewed; and as there is a hole on each ſide, it is impoſſible to know on which hand the object is ſituated which you are viewing. It is chiefly uſed in play-houſes; and hence its name: but we have ſeen it moſt indecently employed by thoſe who ſhould have ſet a better example, even in a cathedral church!

OPHRYS (See *Encycl.*) A new ſpecies of this plant has been lately deſcribed in the *Annual Hampſhire Repoſitory*, by a Fellow of the Linnean Society, in the following words:

" *Stem*—about 12 inches high, erect, ſtipulate, geniculate, pubeſcent at the upper genicles. *Spike*—ſtrictly ſpiral, flowers ſpirally aſcending, about 24, brightly white. Upper petal ovato-acuminate, pubeſcent, lightly ciliate, ſtraight. Two middle *petals* oblong-recurved. Two lower *petals* oblong-acuminate, lightly ciliate only on the lower ſide near the baſe, projecting like elephant's tuſks. *Nectary*, broad, recurved, ragged, bicipitate. *Leaves floral*—carinate acuminate, ciliate reaching and pointing to the middle of the flowers. *Leaves radical*—five or ſix, about ſix inches long, narrow, attenuate both ways, acuminate, the lower more haſtate. *Leaves cauline*—lanceolate, alternate.

" Obſervation.—This plant has much the habit, as well as autumnal floreſcence, of Oriental ſpiralis, and is ſo perfectly ſpiral alſo, that the ſpecific name of the other ſhould be altered, as being no longer excluſively ſpiral; at the ſame time that a ſpecific name ſhould be given to this: neither of which (ſays the author) I ſhall preſume to do, but ſhall ſuggeſt it to the Linnean Society, of which I have the honour to be a Fellow."—This ophrys flowered, for the firſt time, it is believed, in England, in Hampſhire, October 1796.

OPHIUCUS, a conſtellation of the northern hemiſphere; called alſo *Serpentarius*.

OPIUM (See *Encycl.*), is a medicine of ſuch intrinſic value, and of ſo high a price, that every method which promiſes to increaſe the quantity in the market muſt be of importance. It was therefore, with much propriety, that *the Society for the Encouragement of Arts, &c.* ſome time ago, voted 50 guineas to Mr John Ball of Williton, Somerſetſhire, for the diſcovery of his method of preparing opium from poppies of the growth of England. The poppies, which he recommends as the moſt productive, are the *double* or *ſemi-double*, of a dark colour; the ſeeds of which he adviſes to be ſown the latter end of February, and again about the ſecond week in March, in beds three feet and a half wide (well prepared with good rotten dung, and often turned or ploughed, in order to mix it well, and have it fine), either in ſmall drills, three in each bed, in the manner ſallads are ſown, and when about two inches high, to thin them one foot apart; or otherwiſe, to ſow them in beds, in the broad-caſt way, and thin them to the ſame diſtance. If they be kept free from weeds, they will grow well, and will produce from four to ten heads, ſhewing large and different coloured flowers; and when their leaves die away, and drop off, the pods then being in a green ſtate, is the proper time for extracting the opium, by making ſuch longitudinal inciſions as are, for this purpoſe, made in the eaſt (See Opium and Papaver, *Encycl.*) Immediately on the inciſion being made, a milky fluid will iſſue out; which is the opium, and which, being of a glutinous nature, will adhere to the bottom of the inciſion; but ſome poppies are ſo productive, that it will drop from the pod on the leaves underneath. The next day, if the weather ſhould be fine, and a good deal of ſunſhine, the opium will be found a greyiſh ſubſtance, and ſome almoſt turning black: it is then to be ſcraped from the pods, and (if any there) from the leaves, with the edge of a knife, or other inſtrument for that purpoſe, into pans or pots; and in a day or two, it will be of a proper conſiſtence to make into a maſs, and to be potted.

According to Mr Ball, fields cannot be ſown with any thing more lucrative to the farmer than poppies, eſpecially if thoſe fields have a ſouth expoſure. " By a calculation (ſays he) which I have made, ſuppoſing one poppy to grow in one ſquare foot of earth, and to produce only one grain of opium, more than £50 will be collected from one ſtatute acre of land; but if we conſider, that one poppy produces from three or four to ten heads, that in each head from ſix to ten inciſions may be made, and that from many of them, (I mean from one inciſion) I have taken away two or three grains of opium—What muſt then be the produce?"

Mr Ball produced to the Society letters from Dr Latham of Bedford-row, Dr Pearſon of Leiceſter-ſquare, and Mr Wilſon of Bedford-ſtreet, declaring, that, in their opinion, his Engliſh opium is equal in effect, and ſuperior in purity, to the beſt foreign opium.

OPPS, a village in Northampton county, Pennſylvania, 6 miles ſouth-eaſt of Bethlehem, and about 7 north by eaſt of Quaker's Town.—*Morſe*.

OPTIC Inequality, in aſtronomy, is an apparent irregularity in the motions of far diſtant bodies; ſo called, becauſe it is not really in the moving bodies, but ariſing from the ſituation of the obſerver's eye. For if the eye were in the centre, it would always ſee the motions as they really are.

Optic *Pyramid*, in perſpective, is a pyramid formed by the viſible object which is the *baſe*, and the rays drawn from the perimeter of that object, which meet at the eye in a point, which is the *apex* of the pyramid. Hence, alſo, we may know what is meant by an *optic triangle*.

Optic *Rays*, particularly means thoſe by which an optic pyramid, or optic triangle, is terminated.

OPTICS. Under this head in the Encyclopædia n° 259 to 264 have been deſcribed various kinds of microſcopes, which ſee. The Rev. Dr John Prince of Salem, Maſſachuſetts, has politely favoured the editor with the following deſcription of the Lucernal Microscope, the improvements of which are his invention. This account was publiſhed by Mr Hill from Dr Prince's letter in the Gentleman's Magazine for Nov. 1796, and afterwards in Mr Jones's new edition of Adams's Microſcopical Eſſays.

The Lucernal being generally allowed to be the moſt perfect microſcope, and of the moſt extenſive uſe of any yet made, and a very material improvement in the conſtruction of that deſcribed in the Microſcopical Eſſays of that indefatigable artiſt and worthy man the late Mr George Adams, having been ſuggeſted to him by the Rev. Dr Prince of Salem, Maſſachuſetts, at a time when I had given orders for one, I was the firſt perſon for whom he made one on the new principle.

" In the former conſtruction there was no contrivance for bringing the object into the field of view; ſo that, upon the leaſt variation in ſituation or ſize, you were obliged to find out the place for the object by moving it backwards and forwards. This is now remedied by mounting the microſcope on a firm double joint like a teleſcope (as at B). The adjuſting apparatus is fixed at the broad end. The joint is nearly in the centre of gravity, ſo that a very ſmall motion will bring any object, leſs than an inch in diameter, into the field of view. This motion is effected by two ſcrews at right angles to each other; one ſcrew raiſing or covering the body; the other moving it ſideways: the ſcrew at the ſame time forming a double joint to accommodate the parts to the movement (as at C). The handle of the rackwork is ſhewn at D.

Plate I. fig. 1. Appendix,

" To ſcreen the image from the light (which will be often found to be advantageous), there is a pyramidical box, of ſuch a ſize as to pack, when not uſed, in the body of the microſcope. When in uſe, the broad end of the ſcreen-box is to be ſlided into the groove from which the external cover at the end has been taken. This method is peculiarly uſeful in the day-time; as, by ſcreening the large lenſes from the light, it may even then be uſed with ſatisfaction."

A A ſhew the body of the microſcope.

" The large lens may occaſionally be placed on the outer-edge of the ſcreen-box (the other lens being taken out). The view on the grey glaſs is by this means magnified, and appears to greater advantage. But, beſides the grey glaſs uſed in the former conſtruction, there is a ſecond in this, placed farther within the body (about where the dotted line is in the ſketch); and, when the large lens is in the ſcreen-box, I think objects appear better in this than the former way. It has a ſtill greater effect upon thoſe who are unacquainted with the nature of lenſes, as it makes them judge the diſtance and magnitude much greater than they really are, and is, therefore, more pleaſing than the grey glaſs in front."

E ſhews the bottom board, of mahogany.

" It is ſcarcely neceſſary to obſerve, that only one grey glaſs can be uſed at a time, and that both are to be taken out when opake objects are viewed.

" The ſtage (F) is conſiderably different from that figured in my eſſays. It is much more convenient and commodious than the other, and anſwers with very little trouble, and ſcarcely any alteration for both tranſparent and opake objects. A truncated cone can alſo be here applied for cutting off ſuperfluous rays of light occaſionally.

" The method of illuminating the objects is alſo different. The mode now adopted anſwers better for opake and tranſparent objects, throws a ſtronger light, and is more convenient in application. It conſiſts of two lenſes (1 and 2). The larger one is to be placed at the end of the bar next the lamp. The ſmaller one to be adjuſted ſo as to give a ſtrong light. A third is alſo added, to be uſed occaſionally with opake objects. It is to be applied cloſe to the large lens. Experience will ſhew when it is to be uſed, and when laid aſide.

" By moving the bar G (on which theſe lenſes are placed) round about, you bring it ſo much fronting the ſtage as effectually to enlighten opake objects (by means of the lamp. The light thus afforded is received directly, and none is loſt by reflection.

" As ſome objects (ſuch as ſections of wood) are ſeen to advantage both as tranſparent and opake, a frame, containing a plain and a concave mirror, is added to this inſtrument, ſerving two purpoſes: by bringing the bar to the front of the ſtage, removing the large lens, and putting the miror in its place, the object may be viewed either way, without moving from the ſeat, by turning the inſtrument a little round. This experience will diſcover.

" The light of the ſun may be thrown by the plain mirror on the condenſing lens ſo as to produce a ſtrong full field of light on the grey glaſs. This has a grand effect when the large lens is at the end of the ſcreen-box, and could not at all be applied in this manner in former conſtructions. It became alſo an opake ſolar microſcope by turning the bar round to enlighten opake objects.

" By bringing the concave mirror to a focus that will burn objects, a ſet of very curious and entertaining experiments may be made and exhibited on the grey glaſs. The object for combuſtion ſhould be put in the nippers, and a piece of ſlate tied as a ground on the ſtage. The ebullition of a piece of alum viewed in this manner is very beautiful; the bubbles, as they riſe and paſs off rapidly, appear tinged with all the colours of the rainbow.

" There are large-ſized magnifiers for the purpoſe of throwing tranſparent objects on a ſcreen, in imitation of the ſolar microſcope. By removing the large lenſes in front, and the grey glaſs, and placing the black tin cylinder (repreſented in the drawing by dotted marks), over the lamp, they may be ſhewn in that manner to ſeveral perſons. Thus this inſtrument ſuperſedes the uſe of a lantern. The image may be contracted occaſionally by one of the large lenſes."

With reſpect to my own improvement, it is certainly trifling in compariſon with the former; yet, as it unites thoſe parts of the inſtrument that were heretofore ſeparate, and thereby not only makes the whole more compact, but keeps the lamp always in the poſition required, notwithſtanding any motion of the machinery for adjuſting the focal diſtance of the different magnifiers, I have found it extremely convenient, and have no doubt of its being thought ſo by others who may pleaſe to adopt it. It is very ſimple, as the following deſcriptive reference to the plate will evince.

H, the braſs ſupporter to the arm G, to enable it to ſuſtain the weight of the lamp. This turns round with the bar on the ſtage pillar at M.

I, a braſs cap (ſoldered to the ſupporter), and which ſlips over the ſlider that carries the lens 2.

K, a ſtrong joint faſtened to the ſaid cap, which gives the lamp an horizontal movement when an oblique light is required. At the end of this, the lamp is fixed in ſuch manner as eaſily to ſlide in a perpendicular direction to regulate the height of the light.

L, a ſquare piece of braſs, to be occaſionally ſcrewed into the reſervoir of the lamp, to carry the tin cylinder when it is wiſhed to throw tranſparent objects on a ſcreen.

The fixing of Mr Hill's lamp to it is a convenience in uſing the inſtrument; but not eſſential, and it confines the lamp to this uſe only, whereas on a ſtand by itſelf it may anſwer as well for family uſe as for the microſcope.

OR, *Cape d'*, in Nova Scotia, is ſituated on the north ſide of the Baſin of Minas. Some ſmall pieces of copper have been found here.—*Morſe.*

ORA *Cabeca Bay*, on the north ſide of the iſland of Jamaica, in the Weſt-Indies, has a ſtrong fort on the eaſt ſide, and Salt Gut weſterly; at both theſe places is good anchorage for large veſſels.—*ib.*

ORANAI, or *Ranai*, one of the Sandwich Iſlands in the N. Pacific Ocean, 9 miles from Mowee and Morotoi. The ſouth point is in lat. 20 46 north, and long. 156 52 weſt.—*ib.*

ORAN, a conſiderable city, occupied by the Spaniards, in the province of *Maſcara*, in the country of Algiers. It has ſtrong and regular fortifications, and can eaſily be ſupplied from Spain with proviſions and warlike ſtores. It lies in 35′ of longitude weſt from Greenwich, and in 35° 55′ north latitude. Since the year 1732, the Spaniards have held uninterrupted poſſeſſion of Oran. It has a pariſh-church, three monaſteries, an hoſpital: and the number of the inhabitants, according to the account given of it by the Spaniards, amount to 12,000. Towards the ſea, the city riſes in the form of an amphitheatre, and is ſurrounded with forts and batteries. Cloſe to the city lies a ſtrong caſtle, *Alcazava* in which the Spaniſh governor reſides. On the higheſt hill ſtands Fort St Croix, whoſe guns command the city and the adjacent country. From this fort they make ſignals of the approach of ſhips, and carefully watch the motions of the Moors, who often attempt predatory incurſions into the neighbouring diſtricts. A conſiderable number of Mahomedans take refuge in Oran; they dwell in a diſtinct part of the city, receive pay from the court of Spain, and render ſignal ſervices againſt the Moors. The greateſt part of the inhabitants of Oran conſiſts of ſuch as have been baniſhed from Spain; and the ſame may, in a great meaſure, be ſaid of the ſoldiers who compoſe the garriſon. Five regiments are commonly ſtationed here; but, owing to continual deſertion, their ſtrength ſcarcely equals that of four complete regiments. One of them wholly conſiſts of malefactors, who have been condemned to remain here for life; the reſt are ſuch as have been tranſported for one or more years. There is here likewiſe a military ſchool. Around the city are pleaſant gardens; but it is very dangerous to cultivate them, on account of the Moors and Arabs who frequently lie in ambuſh among them. The ſame reaſon prevents the cultivation of the fields in the vicinity; and the garriſon and inhabitants muſt be ſupplied with proviſions immediately from Spain.

ORANG's *Key*, one of the Bahama iſlands, in the Weſt-Indies. N. lat. 24 28, weſt long. 79 37.—*Morſe.*

ORANGE, a bay on the north-eaſt coaſt of the iſland of Jamaica, E. N. E. of the high mountain, a little within land, under which is Crawford's-Town. Alſo a bay at the north-weſt end of the ſame iſland, between Green-Iſland N. and North Negril harbour S. or S. W. —*ib.*

ORANGE, a cape, the eaſt point of Oyapok river, ſouth-eaſt of Cayenne Iſland. N. lat. 4 20, weſt long. 50 50.—*ib.*

ORANGE *Key*, or *Cay*, a ſmall iſland in Orange bay, at the north-weſt end of the iſland of Jamaica.—*ib.*

ORANGE, a county of Vermont, which in 1790, contained 10,529 inhabitants. Since that time ſeveral other counties have been erected out of it. It is bounded weſt by part of Addiſon and Chittenden counties, and eaſt by Connecticut river. It now contains 20 townſhips. The county-town, Newbury, and the townſhips ſouth of it, viz. Bradford, Fairlee and Thetford front Connecticut river. It is high land, and ſends numerous ſtreams in oppoſite directions, both to Connecticut river and to Lake Champlain.—*ib.*

ORANGE, a townſhip on the north line of the above county, in the north-eaſt corner of which is Knox's Mountain.—*ib.*

ORANGE, formerly *Cardigan*, a townſhip in Grafton county, New Hampſhire, which gives riſe to an eaſt branch of Maſcomy river. It was incorporated in 1769; contains 131 inhabitants; and is 20 miles eaſt of Dartmouth college.—*ib.*

ORANGE, a townſhip of Maſſachuſetts, ſituated on the eaſt line of Hampſhire county, on Miller's river, 94 miles N. W. by W. of Boſton. It was incorporated in 1783, and contains 784 inhabitants.—*ib.*

ORANGE, a mountainous and hilly county of New-York, which contains all that part of the State bounded ſoutherly by the State of New Jerſey, weſterly by the State of Pennſylvania, eaſterly by the middle of Hudſon's river, and northerly by an eaſt and weſt line from the middle of Murderer's Creek. It is divided into 8 townſhips, of which Goſhen is the chief, and contains 18,492 inhabitants, of whom 2,098 are electors, and 966 ſlaves. In this county are raiſed large quantities of excellent butter, which is collected at Newburgh and New Windſor, and thence tranſported to New York. On the N. ſide of the mountains in this county, is a very valuable tract called the *Drowned Lands*, containing about 40 or 50,000 acres. The waters which deſcend from the ſurrounding hills, being but ſlowly diſcharged by the river iſſuing from it, cover theſe vaſt meadows every winter, and render them extremely fertile; but they expoſe the inhabitants of the vicinity to intermittents. Wallkill river, which paſſes through this tract and empties into Hudſon's river, is, in the ſpring, ſtored with very large eels in great plenty. The bottom of this river is a broken rock; and it is ſuppoſed that for £2,000 the channel might be deepened ſo as to drain off the waters, and thereby redeem from the floods a large tract of rich land, for graſs, hemp and Indian corn.—*ib.*

ORANGE, called alſo *Orangedale*, a town in Eſſex county, New Jerſey, containing about 80 houſes, a Preſbyterian church, and a flouriſhing academy, and lies north-weſt of Newark, adjoining.—*ib.*

ORANGE, a county of Hillſborough diſtrict, North Carolina; bounded north by Caſwell county, and ſouth by Chatham. The rivers Haw and Enoe in this county have rich lands on their borders. It contains 12,216 inhabitants, of whom 2,060 are ſlaves. Chief town Hillſborough.—*ib.*

ORANGE, a county of S. Carolina, in Orangeburg diſtrict.—*ib.*

ORANGE, a county of Virginia, bounded north by Culpepper, and ſouth by Albemarle. It contains 9,921 inhabitants, including 4,421 ſlaves. The court-houſe is ſituated 20 miles from Culpepper court-houſe, 30 from Charlotteville, and 273 from Philadelphia.—*ib.*

ORANGEBURG, a diſtrict of S. Carolina, bounded ſouth-weſt by Savannah river; eaſt by the river Santee; and north-eaſt by the Congaree, which divide it from Camden diſtrict; ſouth by Beaufort, and ſouth-eaſt by Charleſton diſtrict. It contains 18,513 inhabitants, of whom 5,931 are ſlaves. Sends to the ſtate legiſlature 10 repreſentatives and 3 ſenators; and, with the diſtrict of Beaufort, one member to congreſs. It is divided into 4 counties, viz. Lewiſburg, Orange, Lexington and Winton.—*ib.*

ORANGEBURG, a poſt town of S. Carolina, and capital of the above diſtrict, is on the E. ſide of the north branch of Ediſto river. It has a court houſe, jail, and about 50 houſes; diſtant 77 miles N. N. W. of Charleſton, 36 ſoutherly of Columbia, and 721 from Philadelphia.—*ib.*

ORANGE-MEN, an appellation aſſumed by certain ſocieties in Ireland, of which the firſt was formed in the county of Armagh, on the 21ſt of November 1795, others in ſome towns of Ulſter and Leinſter in the year 1797, another in the city of Dublin 1798; and ſince that period, theſe ſocieties have ſpread over the whole of that kingdom. The object of theſe aſſociations is exhibited in the following authentic *Declaration of the Principles of Orange-men*, publiſhed 1799.

"From the various attempts that have been made to poiſon the public mind, and ſlander thoſe who have had the ſpirit to adhere to their king and conſtitution, and to maintain the laws:—

"We, the Proteſtants of Dublin, aſſuming the name of Orange-men, feel ourſelves called upon, not to vindicate our principles, for we know that our honour and loyalty bid defiance to the ſhafts of malevolence and diſaffection, but openly to avow thoſe principles, and declare to the world the objects of our inſtitution.

"We have long obſerved, with indignation, the efforts that have been made to foment rebellion in this kingdom, by the ſeditious, who have formed themſelves into ſocieties, under the ſpecious name of *United Iriſhmen*.

"We have ſeen with pain the lower orders of our fellow-ſubjects, forced or ſeduced from their allegiance, by the threats or machinations of *traitors*.

"And we have viewed with horror the ſucceſsful exertions of *miſcreants*, to encourage a foreign enemy to invade this happy land, in hopes of riſing into conſequence on the downfal of their country,

"We therefore thought it high time to rally round the conſtitution, and there pledge ourſelves to each other, to maintain the laws, and ſupport our good king againſt all his enemies, whether *rebels* to their God or to their country; and by ſo doing, ſhew to the world that there is a body of men in this iſland, who are ready, in the hour of danger, to ſtand forward in defence of that grand palladium of our liberties, the conſtitution of Great Britain and Ireland, obtained and eſtabliſhed by the courage and loyalty of our anceſtors under the Great King William.

"Fellow-ſubjects, we are accuſed with being an *inſtitution*, founded on principles too ſhocking to repeat, and bound together by oaths, at which human nature may ſhudder: but we caution you not to be led away by ſuch malevolent falſehoods; for we ſolemnly aſſure you, in the preſence of the Almighty God, that the idea of injuring any one, on account of his religious opinion, never entered into our *hearts:* we regard every loyal ſubject as our friend, be his religion what it may; we have no enmity but to the enemies of our country.

"We farther declare, that we are ready, at all times, to ſubmit ourſelves to the orders of thoſe in authority under his majeſty, and that we will cheerfully undertake any duty which they ſhall think proper to point out for us, in caſe either a foreign enemy ſhall dare to invade our coaſts, or that a domeſtic foe ſhall preſume to raiſe the ſtandard of rebellion in the land. To theſe principles we are pledged—and in ſupport of them we are ready to ſpend the laſt drop of our blood.—(Signed) Thomas Verner, *Grand Maſter;* John Clau. Beresford, *Grand Secretary;* William James, J. De Joncourt, Edward Ball."

ORANGETOWN, or *Greenland*, a plantation in Cumberland county, Maine, N. W. of Waterford. One branch of Songo river riſes in the northern part of this plantation, within about 3 miles of Amariſcoggin river, where there is a pond, 2 miles long, called Songo Pond, from thence the ſtream runs ſouthward. It is very difficult to effect roads through this mountainous country; ſome of the mountains affording precipices 200 feet perpendicular. The ſides of the mountains and vallies are fertile, produce good crops, and in ſome inſtances afford wild onions, which reſemble thoſe that are cultivated. Winter rye, which is the chief produce, has amounted to 20 buſhels an acre. The country in the neighbourhood formerly abounded with variety of game, viz. mooſe, deer, bears, beaver, racoon, ſable, &c. but ſince it has been inhabited, game has become ſcarce; deer are extirpated from the vicinity; ſome mooſe remain among the mountains, and a few beaver, that are too ſagacious to be taken by the moſt crafty hunter. Since the deer have been deſtroyed, the wolves have wholly left this part of the country. —*Morse.*

Orangetown, in Orange county, New York, is ſituated on the weſt ſide of the Tappan Sea, oppoſite Philipſburgh, and about 27 miles north of New York city. The townſhip is bounded eaſterly by Hudſon's river, and ſoutherly by the ſtate of New Jerſey. It contains 1175 inhabitants, of whom 162 are electors, and 203 ſlaves.—*ib.*

Orangetown, in Waſhington county, Maine, is 19 miles diſtant from Machias.—*ib.*

ORCHARD. As an appendix to this article in the *Encycl.* ſome of our readers will be pleaſed with the following means, employed by the Rev. Mr *Germerſhauſen*, for promoting the growth of young trees, and increaſing the ſize and flavour of the fruit in orchards.

Having planted ſeveral young plum-trees in an orchard, he covered the ground, for ſome years, around the trunks, as far as the roots extended, with flax-ſhows (A); by which means thoſe trees, though in a graſs-field, increaſed in a wonderful manner, and far excelled others planted in cultivated ground. As far as the ſhows reached, the graſs and weeds were choaked; and the ſoil under them was ſo tender and ſoft, that no better mould could have been wiſhed for by a floriſt.

When he obſerved this, he covered the ground with the ſame ſubſtance, as far as the roots extended, around an old plum-tree, which appeared to be in a languiſhing ſtate, and which ſtood in a graſs field. The conſequences were, that it acquired a ſtrong new bark; produced larger and better-taſted fruit; and that thoſe young ſhoots, which before grew up around the ſtem, and which it was every year neceſſary to deſtroy, were prevented from ſprouting forth, as the covering of flax-ſhows impeded the free acceſs of air at the bottom of the trunk.

In the year 1793, he tranſplanted, from ſeed-beds, into the nurſery, ſeveral fruit-trees; the ground around ſome of which he covered, as above, with flax-ſhows. Notwithſtanding the great heat of the ſummer, none of thoſe trees where the earth was covered with ſhows died or decayed; becauſe the ſhows prevented the earth under them from being dried by the ſun. Of thoſe trees around which the ground was not covered as before mentioned, the fourth part miſcarried; and thoſe that continued alive were far weaker than the former.

The leaves which fall from trees in autumn may alſo be employed for covering the ground in like manner; but ſtones, or logs of wood, muſt be laid on them, to prevent their being diſperſed by the wind. In graſs-land, a ſmall trench may be made around the roots of the tree, when planted, in order to receive the leaves. If flax-ſhows are uſed, this is not neceſſary; they lie on the ſurface of the ground ſo faſt as to reſiſt the force of the moſt violent ſtorm. The leaves which our author found moſt effectual in promoting the growth and fertility of fruit trees, are thoſe of the walnut-tree. Whether it is, that, on account of their containing a greater abundance of ſaline particles, they communicate manure to the ground, which thereby becomes tender under them; or that they attract nitrous particles from the atmoſphere; or that, by both theſe means, they tend to nouriſh the tree both above and below.

Thoſe who are deſirous of raiſing tender exotic trees from the ſeed, in order to accuſtom them to our climate, may, when they tranſplant them, employ flax-ſhows with great advantage. This covering will prevent the froſt from making its way to the roots; and rats and mice, on account of the ſharp prickly points of the flax-ſhows, will not be able to ſhelter themſelves under them.

ORCHILLA, a weed uſed in dyeing, which grows in the Canary Iſlands, and is monopolized by the government. "It is a minute vegetable (ſays Sir George Staunton), of the lichen kind, growing chiefly upon rocks of a looſe texture, and produces a beautiful violet blue colour."

Orchilla, one of the Leeward iſlands in the Weſt-Indies, ſituated near the coaſt of Terra Firma, S. America; between the iſlands of Tortuga and Reca, 15 or 16 leagues north-weſt of the former, and 6 or 7 E. and E. by N. of the latter. It is about 8 leagues long. On the S. and S. W. ſide, the ſtrand is ſteep and bold, ſo that a ſhip may lay her broadſide cloſe to the ſhore; but the north ſide is foul and rocky. Here is no good water, nor indeed any thing elſe but ſhelter from northerly winds, and goat's fleſh. It is divided into ſeveral ſmall iſlands, ſeparated from each other by ſhallow canals. N. lat. 11 52, W. long. 65 15.—*Morse.*

ORDADO *Rock*, near the coaſt of Peru, is 4 miles ſouth by eaſt of Port Callao. Near it are ſome ſmaller ones, and round them from 9 to 16 fathoms water.—*ib.*

ORDEAL. See this article in the *Encyclopædia*, at the end of which we have given, from Dr Henry's Hiſtory of England, ſome ſtrong reaſons for ſuſpecting that the ordeal, by fire at leaſt, was a groſs impoſition on the credulity of an ignorant and ſuperſtitious age. This ſuſpicion of impoſture is raiſed to certainty by Profeſſor Beckmann, who, in his Hiſtory of Inventions, gives us the whole proceſs by which the clergy conducted the trial, and brought proofs of innocence or of guilt at their pleaſure. The perſon accuſed was put entirely under their management for three days before the trial, and for as many after it. They covered his hands (when he was to lift red-hot iron) both before and after the proof; ſealed and unſealed the covering. The former was done, as they pretended, to prevent the hands from being prepared any how by art; the latter, that it might be accurately known whether or not they were burnt.

Some artificial preparation was therefore known, elſe no precautions would have been neceſſary. It is highly probable, that during the three firſt days the preventative was applied to thoſe perſons whom they wiſhed to appear innocent; and that the three days after the trial were requiſite to let the hands reſume their natural ſtate. The ſacred ſealing ſecured them from the examination of preſumptuous unbelievers; for to determine whether the hands were burnt, the three laſt days were certainly not wanted. When the ordeal was aboliſhed, and this

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(A) Shows are the refuſe of flax when it is ſcutched or heckled.

this art rendered uſeleſs, the clergy no longer kept it a ſecret. In the 13th century, an account of it was publiſhed by Albertus Magnus, a Dominican monk (A). If his receipt be genuine, it ſeems to have conſiſted rather in covering the hands with a kind of paſte than in hardening them. The ſap of the *althæa* (marſhmallow), the ſlimy ſeeds of the flea-bane, which is ſtill uſed for ſtiffening by the hat-makers and ſilk-weavers, together with the white of an egg, were employed to make the paſte adhere. And by theſe means the hands were as ſafe as if they had been ſecured by gloves.

OREAHOU, or *Oreehou*, a ſmall elevated iſland, cloſe to the north ſide of Oneeheow, one of the Sandwich Iſlands, with which it is connected by a reef of coral rocks. It contains about 4,000 inhabitants. N. lat. 22 2, W. long. 160 8.—*Morse.*

Hutton's Dictionary.

ORFFYREUS's Wheel, in mechanics, is a machine ſo called from its inventor, which he aſſerted to be a perpetual motion. This machine, according to the account given of it by Graveſande, in his *Oeuvres Philoſophiques*, publiſhed by Allemand, Amſt. 1774, conſiſted externally of a large circular wheel, or rather drum 12 feet in diameter, and 14 inches deep; being very light, as it was formed of an aſſemblage of deals, having the intervals between them covered with waxed cloth, to conceal the interior parts of it. The two extremities of an iron axis, on which it turned, reſted on two ſupports. On giving a ſlight impulſe to the wheel, in either direction, its motion was gradually accelerated; ſo that, after two or three revolutions, it acquired ſo great a velocity as to make 25 or 26 turns in a minute. This rapid motion it actually preſerved during the ſpace of two months, in a chamber of the landgrave of Heſſe, the door of which was kept locked, and ſealed with the landgrave's own ſeal. At the end of that time it was ſtopped, to prevent the wear of the materials. The profeſſor, who had been an eye witneſs to theſe circumſtances, examined all the external parts of it, and was convinced that there could not be any communication between it and any neighbouring room. Orffyreus, however, was ſo incenſed, or pretended to be ſo, that he broke the machine in pieces; and wrote on the wall, that it was the impertinent curioſity of Profeſſor Graveſande which made him take this ſtep. The prince of Heſſe, who had ſeen the interior parts of this wheel, but ſworn to ſecrecy, being aſked by Graveſande, whether, after it had been in motion for ſome time, there was any change obſervable in it, and whether it contained any pieces that indicated fraud or deception? anſwered both queſtions in the negative, and declared, that the machine was of a very ſimple conſtruction.

ORFORD, a townſhip in Grafton county, New Hampſhire, ſituated on the eaſt bank of Connecticut river, about 11 miles north of Hanover, and oppoſite to Fairlee in Vermont, 395 miles N. N. E. of Philadelphia. It was incorporated in 1761, and contains 540 inhabitants. The ſoap-rock, which has the property of fuller's earth in cleanſing cloth, is found here; alſo alum ore, free-ſtone fit for building, and a grey ſtone, in great demand for mill-ſtones, reckoned equal in quality to the imported burr-ſtones.—*Morse.*

Orford, *Cape*, the north-weſternmoſt point of the large iſland to the weſtward of Falkland's Sound in the Falkland's Iſlands, in the S. Atlantic Ocean, and ſouth-eaſt of Cape Percival.—*ib.*

ORICOU, a new ſpecies of the vulture, diſcovered by Vaillant at Orange river, in South Africa. As he thinks it unqueſtionably the moſt beautiful of its genus, and tells, as uſual with him, a wonderful ſtory about it, we have given a figure of this vulture in Plate XLI. Our traveller ſays, that it is more than three feet high, and eight or nine in breadth of wing. Its feathers, the general hue of which is a light brown, are of a particular kind on the breaſt, belly, and ſides, where they are of unequal lengths, pointed, curved like the blade of a ſabre, and briſtle up diſtinct from each other. The feathers being thus ſeparated, would diſcloſe to view the ſkin on the breaſt, if it were not completely covered with a very thick and beautiful white down, which is eaſily ſeen between the ruffled plumage.

A celebrated naturaliſt has ſaid, that "no bird has eye laſhes or eye-brows, or, at leaſt, hair round the eyes like that in quadrupeds." This aſſertion, advanced as a general law of Nature, is a miſtake. Not only the oricou has this peculiarity, but we know of many other ſpecies in which it exiſts; ſuch as, in general, all the calaos, the ſecretary, and ſeveral other birds of prey. Beſide theſe eye-laſhes, the vulture in queſtion has ſtiff black hairs on its throat. All the head and part of the neck are bare of feathers; and the naked ſkin, which is of a reddiſh colour, is daſhed in certain places with blue, violet, and white. The ear, in its external circumference, is bounded by a prominent ſkin, which forms a ſort of rounded conch, that muſt neceſſarily heighten the faculty of hearing in this ſpecies. This kind of conch is prolonged for ſome inches, and deſcends down the neck; which induced our author to give it the name of *oricou*.

Its ſtrength, he ſays, muſt be very conſiderable, if we may judge from its muſcles and ſinews; and he is perſuaded that there is not a ſtronger among the whole order of carnivorous birds, not excepting the famous condor, which ſo many travellers have ſeen, but of which their deſcriptions are ſo different as to render its exiſtence extremely doubtful. But there was no occaſion for this reaſoning, and thoſe inferences, if what he relates as facts deſerve any credit. The oricou which he deſcribes, he firſt perceived perched on the carcaſe of a hippopotamos, eagerly devouring its fleſh. He ſhot at it, and wounded it ſlightly; upon which, "though it had already gorged itſelf with a conſiderable quantity of fleſh (for upon opening it, he found in its ſtomach no leſs a quantity than *ſix pounds and a half*), yet its hunger

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(A) In his work *De Mirabilibus Mundi*, at the end of his book *De Secretis Mulierum*, Amſtelod. 1702, 12mo, p. 100. Experimentum mirabile quod facit hominem ire in ignem ſine læſione, vel portare ignem vel ferrum ignitum ſine læſione in manu. Recipe ſuccum biſmalvæ, et albumen ovi, et ſemen pſylli et calcem, et pulveriza, et confice cum illo albumine ovi ſuccum raphani; commiſce; ex hac confectione illineas corpus tuum vel manum, et dimitte ſiccari, et poſtea iterum illineas, et poſt hoc poteris audacter ſuſtinere ignem ſine nocumento.

OIL MILL, PLATE XXXIX.

Fig. M.

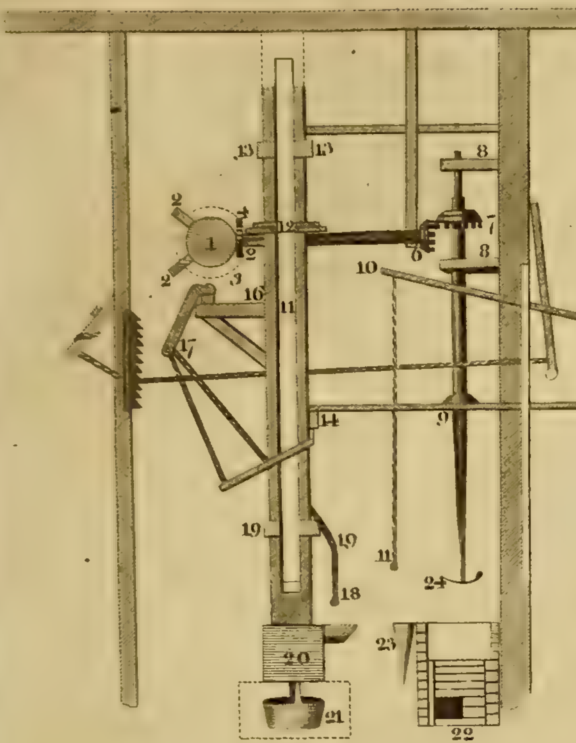


Fig. N.

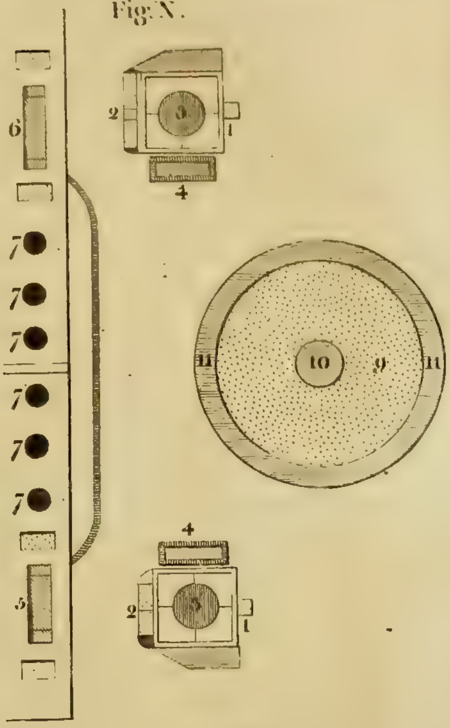


Fig. O.

Fig. P.

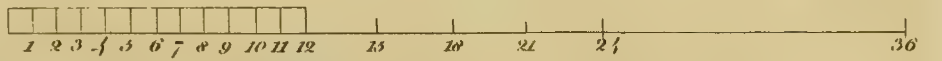


Fig. Q.

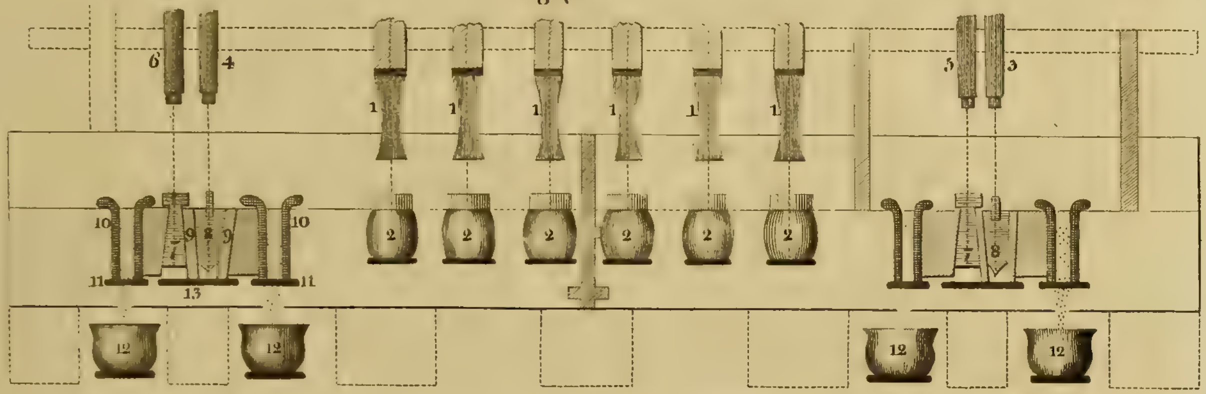


Fig. S.

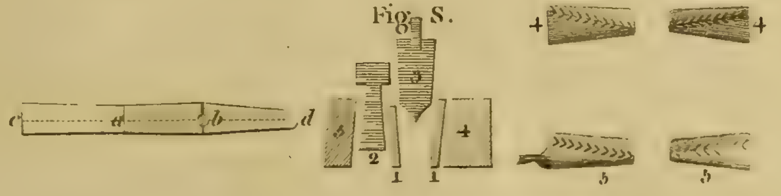
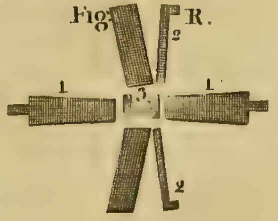
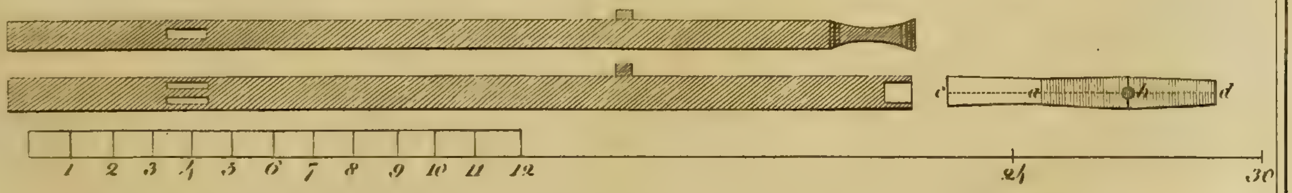


Fig. R.





Lawson, sc.

ger and voracity were ſuch, that it ſtruck its beak into the carcaſe when attempting to take wing, as if deſirous of carrying the whole of it away.

"On the other hand, the weight of the fleſh it had devoured rendering it the more heavy, it could not eaſily riſe; ſo that we had time (ſays he) to reach it before it was on the wing, and we endeavoured to knock it on the head with the but-ends of our muſkets. It defended itſelf a long time with great intrepidity. It bit or ſtruck at our weapons with its beak, and its ſtrength was ſtill ſo great, that every ſtroke made a mark on the *barrel of the piece*."

ORIENT, the eaſt, or the eaſtern point of the horizon.

ORIENT *Equinoctial*, is uſed for that point of the horizon where the ſun riſes, when he is in the equinoctial, or when he enters the ſigns Aries and Libra.

ORIENT *Æſtival*, is the point where the ſun riſes in the middle of ſummer, when the days are longeſt.

ORIENT *Hybernal*, is the point where the ſun riſes in the middle of winter, when the days are ſhorteſt.

ORLEANS, the middle of the three northern counties of Vermont. A part of Lake Memphremagog projects into the northern part of it from Canada. It contains 23 townſhips. It is very high land, and ſends its waters in almoſt every direction of the compaſs. Clyde, Barton and Black rivers empty into Lake Memphremagog; the waters of many branches of Miſſiſcoui, La Moelle, and Onion rivers, riſing here, fall into Lake Champlain; thoſe of Mulhegan and Paſumpſick empty into Connecticut river.—*Morſe.*

ORLEANS, a townſhip in the county of Barnſtable, Maſſachuſetts, taken from the ſoutherly part of Eaſtham, and incorporated 1797.—*ib.*

ORLEANS, *Iſle of*, is ſituated in the river St Lawrence, a ſmall diſtance below Quebec, and is remarkable for the richneſs of its ſoil. It lies in the middle of the river, the channel is upon the S. ſide of the iſland, the N. ſide not having depth of water at full tide, even for ſhallops. The S. W. end of the iſland is called Point Orleans. The coaſt is rocky for a mile and a half within the S. channel, where there is a careening place for merchant ſhips. Round Point Levi, and along the S. E. ſide of the river, the ſhore is rocky, but the middle of the baſon is entirely free.—*ib.*

ORLEANS, *Old Fort*, is ſituated on the W. bank of a bend of Miſſouri river, in Louiſiana, a conſiderable diſtance from its mouth.—*ib.*

ORODADA PENA, on the coaſt of Peru, is two leagues due north of Lobos de Payta, and 2 ſouth by weſt of Payta.—*ib.*

OROMCOTO, a river of New Brunſwick, which empties into St John's river. By this paſſage the Indians have a communication with Paſſamaquoddy Bay.—*ib.*

ORONDOCKS, an Indian tribe who live near Trois Rivieres, and could furniſh 100 warriors about 20 years ago.—*ib.*

ORONOKO, or *Oronoque*, one of the largeſt rivers of S. America, and is remarkable for its riſing and falling once a year only; for it gradually riſes during the ſpace of 5 months, and then remains one month ſtationary, after which it falls for 5 months, and in that ſtate continues for one month alſo. Theſe alternate changes are regular, and even invariable. Perhaps the riſing of the waters of the river may depend on the rains which conſtantly fall in the mountains of the Andes, (where the river has its ſource) every year about the month of April; and though the height of the flood depends much upon the breadth or extent of the bed of the river, yet in one part where it is narroweſt, it riſes to the aſtoniſhing height of 120 feet. The mouth of the river is S. by E. of the Gulf of Paria, in lat. 8 30 N. and long. 59 50 W. and oppoſite to the Iſland of Trinidad. It is large and navigable, and has many good towns on its banks, that are chiefly inhabited by the Spaniſh, and is joined alſo on the E. ſide by the Lake Caſipa. There are two other iſlands at its mouth, the entrance to which is alſo ſomewhat dangerous, as there is frequently a dreadful conflict between the tide of the ocean and the current of the river, that muſt, for the reaſons aſſigned, ſometimes run very rapidly. It is ſaid the river, including its windings, takes a courſe of 1380 miles, and preſerves the freſhneſs of its waters *twelve leagues* from the mouth of that vaſt and deep channel, within which it was confined. It may be conſidered, however, as having many mouths, which are formed by the iſlands that lie before its opening towards the ocean; yet there are only two that are conſidered as of any uſe for the purpoſes of navigation. Theſe are the channels of Sabarima and Corobana, otherwiſe called Caribbiana. The latter lies in a S. by W. direction, and is alſo divided into two diſtinct channels, that afterwards meet again at the iſland of Trinidad in the mouth of the Grand river. But pilots pretend to ſay, that the mouth of this great river begins from the river Amugora, reaching from thence to the river Sabarima, and from thence about to the river Caribbiana; and ſome accounts ſtate its mouths to be 40 in number, as if it were a collection of many rivers, all uniting at the mouth of the great river, and aſſiſting to convey the main ſtream of that river into the ocean. The weſt paſſage or channel of the river Oronoko, called by the Spaniards the Gulf of Paria, lies between Cape Salinas on the main, and the north-weſt point of the iſland of Trinidad. It contains ſeveral iſlands, which divide the ſtream of the river into ſeveral branches, particularly the Great Boco, or mouth, which is the eaſternmoſt, being about gun-ſhot wide, but having no ſoundings, with 300 fathoms, and the Little Boco, or Mouth, which is the weſternmoſt, being almoſt as wide as the other, and having ground at from 50 to 60 fathoms. At New Cape Araya, on the northward ſide of the mouth of this river, are ſalt pits, which yield the fineſt ſalt in the world. In ſome maps, the head-waters are called Inirchia.—*ib.*

OROPESA, a town in the juriſdiction of La Plata, S. America; ſituated 60 miles N. W. of that city, in the valley of Cochabamba, on a ſmall rivulet which empties into the river Guapay. It has a conſiderable trade in corn and fruits.—*ib.*

OROPESA, a town of S. America, in Peru, ſeated at the foot of the mountains, 750 miles from Lima, and 150 N. E. of Potoſi. S. lat. 18, W. long. 63 30.—*ib.*

OROTAVA, a town in the Iſland of Teneriffe, at the bottom of thoſe mountains out of which the Peek riſes, neatly built of ſtone, on an irregular ſurface. The moſt remarkable object near it is a dragon's blood tree, of which the trunk meaſures, at the height of ten feet from the ground, 36 feet in girth. Concerning this tree there is a tradition current in the iſland, that it exiſted, of no inconſiderable dimenſions, when the Spaniards made the conqueſt of Teneriffe, about three centuries ago; and that it was then, what it ſtill is, a land mark, to diſtinguiſh the boundaries of landed poſſeſſions near it.

Diſtant about three miles on the ſea-coaſt is the puerto, or ſea-port, of Orotava, where is carried on a conſiderable degree of commerce, principally for the exportation of wine. It is chiefly, as at Madeira, in the hands of a few Britiſh commercial houſes, which import, in return, the manufactures of Great Britain. Within a mile is a collection of living plants from Mexico, and other parts of the Spaniſh dominions in America. From hence they are to be tranſplanted into Spain. It is an eſtabliſhment of ſome expence; and, whatever may be its ſucceſs, it ſhows a laudable attention, on the part of that government, to the promotion of natural knowledge.

OROTCHYS and BITCHYS, two tribes of Tartars, who were viſited by La Perouſe in 1787, and of whoſe manners he gives ſuch an account as renders it difficult to ſay whether they have the beſt claim to be called a ſavage or a civilized people. He fell in with a ſmall village of them on the eaſt coaſt of Tartary, in a bay to which he gave the name of *Baie de Caſtrie*, in lat. 51° 29′ north, and long. 139° 39′ eaſt from Paris.

Their village, their employment, their dreſs, and their apparent ignorance of all religion, beſpoke them ſavages. Their village was compoſed of four cabins, built in a ſolid manner, of the trunks of fir-trees, and covered with bark. A wooden bench compaſſed the apartment round about; and the hearth was placed in the middle, under an opening large enough to give vent to the ſmoke.

This village was built upon a tongue of low marſhy land, which appeared to be uninhabitable during the winter; but on the oppoſite ſide of the gulf, on a more elevated ſituation, and expoſed to the ſouth, there was, at the entrance of a wood, another village, conſiſting of eight cabins, much larger and better built than the firſt. Above this, and at a very ſmall diſtance, were three yourts, or ſubterraneous houſes, perfectly ſimilar to thoſe of the Kamtſchadales, deſcribed in the third volume of Captain Cook's laſt voyage; they were extenſive enough to contain the inhabitants of the eight cabins during the rigour of the cold ſeaſon; beſides, on ſome of the ſkirts of this village were ſeen ſeveral tombs, which were larger and better built than the houſes; each of them encloſed three, four, or five biers, of a neat workmanſhip, ornamented with Chineſe ſtuffs, ſome pieces of which were brocade. Bows, arrows, lines, and, in general, the moſt valuable articles of theſe people, were ſuſpended in the interior of theſe monuments, the wooden door of which was cloſed by a bar, ſupported at its extremities by two props.

Their ſole employment ſeemed to be the killing and curing of ſalmon, of which they eat raw, the ſnout, the gills, the ſmall bones, and ſometimes the entire ſkin, which they ſtrip off with infinite dexterity. When the ſtript ſalmon were carried to the huts, the women, in the moſt diſguſting manner, devoured the mucilaginous part of them, and ſeemed to think it the moſt exquiſite food. Every cabin was ſurrounded with a drying place for ſalmon, which remain upon poles, expoſed to the heat of the ſun, after having been during three or four days ſmoked round the fire, which is in the middle of their cabin; the women, who are charged with this operation, take care, as ſoon as the ſmoke has penetrated them, to carry them into the open air, where they acquire the hardneſs of wood.

The bones of the ſalmon ſo cured were ſcattered, and the blood ſpread round the hearth; greedy dogs, though gentle and familiar enough, licked and devoured the remainder. The naſtineſs and ſtench of this people are diſguſting. There is not perhaps anywhere a race of people more feebly conſtituted, or whoſe features are more different from thoſe forms to which we attach the idea of beanty; their middle ſtature is below four feet ten inches, their bodies are lank, their voices thin and feeble, like that of children; they have high cheek bones, ſmall blear eyes, placed diagonally; a large mouth, flat noſe, ſhort chin, almoſt beardleſs, and an olive-coloured ſkin, varniſhed with oil and ſmoke. They ſuffer their hair to grow, and tie it up nearly the ſame as we do; that of the women falls looſe about their ſhoulders, and the portrait which has juſt been drawn agrees equally well with their countenances as thoſe of the men, from whom it would be difficult to diſtinguiſh them, were it not for a ſlight difference in the dreſs, and a bare neck; they are not, however, ſubjected to any labour, which might, like the American Indians, change the elegance of their features, if nature had furniſhed them with this advantage. Their whole cares are limited to the cutting and ſewing their clothes, diſpoſing of their fiſh to be dried, and taking care of their children, to whom they give the breaſt till they are three or four years of age.

With reſpect to dreſs, the men and little boys are clothed with a waiſtcoat of nankeen, or the ſkin of a dog or a fiſh, cut in the ſhape of a waggoner's frock. If it reach below the knee, they wear no drawers; if it do not, they wear ſome in the Chineſe ſtyle, which fall as low as the calf of the leg. All of them have boots of ſeal's ſkin, but they keep them for the winter; and they at all times, and of every age, even at the breaſt, wear a leather girdle, to which are attached a knife in a ſheath, a ſteel to ſtrike a light with, a pipe, and a ſmall bag to contain tobacco. The dreſs of the women is ſomewhat different; they are wrapped up in a large nankeen robe, or ſalmon's ſkin, which they have the art of perfectly tanning, and rendering extremely ſupple. This dreſs reaches as low as the ankle-bone, and is ſometimes bordered with a fringe of ſmall copper ornaments, which make a noiſe ſimilar to that of ſmall bells. Thoſe ſalmon, the ſkins of which ſerve for clothing, are never caught in ſummer, and weigh thirty or forty pounds.

Though they had neither prieſts nor temples, they ſeemed to be believers in ſorcery, and took the motion of the Frenchmen's hands, when writing, for ſigns of magic. Thus far they appeared ſavages.

Their ſacred regard of property, their attention to their women, and the delicacy of their politeneſs to ſtrangers, would, on the other hand, do honour to the moſt civilized nation. While Perouſe and his people were in the bay, one of the families took its departure on a voyage of ſome length, and did not return during their ſtay. When he went away, the maſter of the family put ſome planks before the door of his houſe, to prevent the dogs from entering it, and in this ſtate left it full of their effects. "We were ſoon (ſays our author) ſo perfectly convinced of the inviolable fidelity of theſe people, and their almoſt religious reſpect for property, that we left our ſacks full of ſtuffs, beads, iron tools, and, in general, every thing we uſed as articles of barter, in the middle of their cabins, and under no other ſeal of ſecurity than their own probity, without a ſingle inſtance of their abuſing our extreme confidence; and on our departure from this bay, we firmly entertained the opinion, that they did not even ſuſpect the exiſtence of ſuch a crime as theft."

Their attention to their women, ſo uncommon among ſavages was diſplayed in their exempting them from hard labour; in their never concluding a bargain with the Frenchmen without previouſly conſulting their wives; and in their reſerving the pendent ſilver ear-rings and copper trinkets, which they purchaſed, for their wives and daughters. Of the delicacy of their manners to ſtrangers, we ſhall give the following intereſting inſtance in the words of Perouſe's tranſlator:

Obſerving with what repugnance they received preſents, and how often they refuſed them with obſtinacy, "I imagined (ſays Perouſe) I could perceive, that they were perhaps deſirous of more delicacy in the manner of offering them; and to try if this ſuſpicion were well founded, I ſat down in one of their houſes, and after having drawn towards me two little children, of three or four years old, and made them ſome trifling careſſes, I gave them a piece of roſe-coloured nankeen, which I had brought in my pocket. The moſt lively ſatisfaction was viſibly teſtified in the countenances of the whole family, and I am certain they would have refuſed this preſent, had it been directly offered to themſelves. The huſband went out of his cabin, and ſoon afterwards returning with his moſt beautiful dog, he entreated me to accept of it. I refuſed it, at the ſame time endeavouring to make him underſtand, that it was more uſeful to him than to me: but he inſiſted; and perceiving that it was without ſucceſs, he cauſed the two children, who had received the nankeen, to approach, and placing their little hands on the back of the dog, he gave me to underſtand, that I ought not to refuſe his children.

"The delicacy of ſuch manners cannot exiſt but among a very poliſhed people. It ſeems to me, that the civilization of a nation, which has neither flocks nor huſbandry, cannot go beyond it. It is neeceſſary to obſerve, that dogs are their moſt valuable property; they yoke them to ſmall and very light ſledges, extremely well made, and exactly ſimilar to thoſe of the Kamtſchadales. Thoſe dogs, of the ſpecies of wolf dogs, and very ſtrong, though of a middle ſize, are extremely docile, and very gentle, and ſeem to have imbibed the character of their maſters."

ORPHAN's *Bank*, a fiſhing bank of the S. E. point of Chaleur's Bay, on the N. E. coaſt of New Brunſwick, in N. America. On it is from 75 to 30 fathoms water.—*Morſe*.

ORPHAN's *Iſland*, a ſettlement belonging to Hancock county, Diſtrict of Maine, having 124 inhabitants. —*ib*.

ORRINGTON, a plantation in Hancock county, Diſtrict of Maine, having 477 inhabitants. It lies on the eaſt ſide of Penobſcot river, 16 miles above Buckſtown, and 256 N. N. E. of Boſton.—*ib*.

ORTHODROMICS, in navigation, is great-circle ſailing, or the art of ſailing in the arch of a great circle, which is the ſhorteſt courſe: For the arch of a great circle is *orthodromia*, or the ſhorteſt diſtance between two points or places.

ORUA, *Orubo*, or *Aruba*, the moſt weſterly of the Caribbee Iſlands in the Weſt-Indies, called by the Spaniards Las Iſlas de Sottovento. It is on the coaſt of the Spaniſh Main. N. lat. 12 3, W. long. 69 3.—*Morſe*.

ORURO, a juriſdiction in the archbiſhopric of La Plata. Its capital is San Phelipe de Aſturia de Oruro, 30 leagues from the city of La Plata.—*ib*.

ORWEL, a townſhip of Vermont, the north-weſternmoſt in Rutland county, and ſituated on the eaſt ſide of Lake Champlain. It contains 778 inhabitants. Mount Independence ſtands in this townſhip oppoſite Ticonderoga, in the ſtate of New York. Near Mount Independence is a chalybeate ſpring.—*ib*.

ORYCTEROPUS, the name given by M. Geoffroy, profeſſor of zoology in the French muſeum of natural hiſtory, to the animal called by other zoologiſts *Myrmecophaga Capenſis*. (See MYRMECOPHAGA, *Encycl.*) He conſiders it as a diſtinct genus, and ſeems indeed to have proved, by a compariſon of the organs of the orycteropus with thoſe of the *tatous daſipus* of Linnæus, and of the *myrmecophagi*, that this genus is intermediate, by its forms and habits, between thoſe two families. It approaches to the *tatous* in its organs of maſtication, and the form of the toes and nails, and in having a ſhort and ſingle cæcum, whilſt that of the myrmecophagi is double, as in birds, by the reuniting of the bones of the os pubis, which are not articulated together in the myrmecophagi. The orycteropus, however, bears a relation to the laſt, ſince it has, like them, a very ſmall mouth, whence its tongue, covered with hair, may be protruded to a conſiderable length. Finally, the habits of the orycteropus reſemble thoſe of the animals to which it approaches the moſt; it does not climb trees, but lives under the earth like the tatous; it feeds like them on roots, but alſo it hunts after anthills, like the myrmecophagi. Its ſnout terminates in a blunt callus; a character which is peculiar to it. It may be diſtinguiſhed in the works of naturaliſts by the following deſcription:

Orycteropus. Molar teeth (ſix) with flat vertices; the body covered with hair.

The orycteropus, as appears from the preceding, connects the tatous with the myrmecophagi and with the *pangolin manis* of Linnæus. The large foſſile ſpecies found in Paraguay, for which Citizen Cuvier has eſtabliſhed a new genus, under the name of *megaterium*, is intermediate between the ſloth and the myrmecophagus; and, laſtly, the aſtoniſhing animal of New Holland, covered with briſtles like the porcupine, ſupported by very ſhort legs, and of very ſingular conformation, and with a head round at the occiput, terminating in a ſnout, without teeth, very ſlender, long, and cylindrical, and deſcribed by Mr George Shaw under the name of myrmecophaga aculeata, appears to have very ſtriking relations to the pangolin and the orycteropus: from hence it follows, that in conſequence of theſe important acquiſitions, we ought for the future to count, in the number of our natural orders, that of the *edentated*, or *edented*, conſiſting of the following genera: *Daſipus*, *oryčteropus myrmecophaga*, and *aculeata*, *manis*, *myrmecophaga*, *megaterium* et *bradypus*.

OSAGES, an Indian nation who inhabit ſouth of the Miſſouri, and can furniſh 400 warriors.—*Morse.*

Osages, a river of Louiſiana, which runs eaſtward to the Miſſouri.—*ib.*

OSCILLATION, in mechanics, vibration, or the reciprocal aſcent and deſcent of a pendulum.

Axis of Oscillation, is a line parallel to the horizon, ſuppoſed to paſs through the centre or fixed point about which the pendulum oſcillates, and perpendicular to the plane in which the oſcillation is made.

Centre of Oscillation, in a ſuſpended body, is a certain point in it, ſuch that the oſcillations of the body will be made in the ſame time as if that point alone were ſuſpended at that diſtance from the point of ſuſpenſion. Or it is the point into which, if the whole weight of the body be collected, the ſeveral oſcillations will be performed in the ſame time as before: the oſcillations being made only by the force of gravity of the oſcillating body.

OSCULATION, in geometry, denotes the contact between any curve and its oſculatory circle; that is, the circle of the ſame curvature with the given curve, at the point of contact or of oſculation. See Involution in this *Suppl.*

Osculation alſo means the point of concourſe of two branches of a curve which touch each other. For example, if the equation of a curve be $y = \sqrt{x} + \sqrt[4]{x^3}$, it is eaſy to ſee that the curve has two branches touching one another at the point where $x = 0$, becauſe the roots have each the ſigns + and —.

OSNABURG, a ſmall iſland in the S. Pacific Ocean, having the appearance of the roof of a houſe. It is about 4 leagues in circuit; is high land; full of cocoa-trees; has no anchoring place, and ſcarcely affords landing for a boat. It was diſcovered by Capt. Wallis, and is called *Maitea* by the natives. S. lat. 17 52, W. long. 148 6.—*Morse.*

Osnaburg, another iſland in the ſame ſea, diſcovered by Capt. Carteret. S. lat. 22, W. long. 141 34.—*ib.*

Osnaburg *Houſe*, a ſettlement of the Hudſon's Bay Company, in N. America; ſituated at the N. E. corner of Lake St Joſeph, 120 miles W. by S. of Glouceſter Houſe. N. lat. 51, W. long. 90 15.—*ib.*

OSORNO, an inland town of the kingdom of Chili, ſituated on the N. bank of the river Buena; 42 miles E. of the ſea coaſt, and 45 S. E. of Baldivia. The adjacent country is far from being fruitful, but very rich in gold mines, which renders the place very populous. S. lat. 40 30, W. long. 71 50.—*ib.*

OSSABAW *Sound* and *Iſland*, on the coaſt of the State of Georgia. The ſound opens between Waſſaw Iſland on the N. and Oſſabaw Iſland on the S. and leads into the river Ogeechee.—*ib.*

OSSIPEE, or *Oſapy*, a townſhip, mountain, and pond, in New Hampſhire, in Strafford county, near the E. line of the State. The town was incorporated in 1785, and has 339 inhabitants. The lake lies N. E. of Winipiſeogee Lake, between which and Oſſipee Lake is *Oſſipee Mountain*, deſcribed in the account of New Hampſhire. Its waters run E. and, joined by South river, form *Great Oſſipee River*, which empties into Saco river, near the diviſion line between York and Cumberland counties, in Maine, between Limerick and Gorham.—*ib.*

OSSNOBIAN, or *Aſſeneboyne Indians*, a tribe found about the ſource of Oſſnobian or Aſſeneboyne river, far W. of Lake Superior. They are ſaid by the Moravian miſſionaries to live wholly on animal food, or at leaſt to confine themſelves to the ſpontaneous productions of nature; giving thoſe who dig the ground, the appellation of *ſlaves*. Bread is unknown to them. A traveller, who lived ſome months in their country, offered to ſome a few remnants of bread, which they chewed and ſpit out again, calling it rotten wood. Theſe Indians, as well as thoſe numerous nations who inhabit the country from Lake Superior, towards the Shining Mountains, are great admirers of the beſt hunting-horſes, in which the country abounds. The horſes prepared by them for hunters, have large holes cut above their natural noſtrils, which they ſay makes them longer-winded than others not thus prepared. The Oſſnobians have no permanent place of abode, but live wholly in tents, made of buffaloe and other hides, with which they travel from one place to another, like the Arabs; and as ſoon as the food for their horſes is expended, they remove, and pitch their tents in another fertile ſpot; and ſo on continually, ſcarcely ever returning to the ſame ſpots again.—*ib.*

OSTICO, a ſmall lake in Onondago county, New York, partly in the S. E. corner of Marcellus, and N. W. corner of the townſhip of Tully. It ſends its waters from the N. end, which is eight miles S. weſterly of Onondago Caſtle, by a ſtream 16 miles long, to Salt Lake.—*ib.*

OSTINES, or *Charleſtown*, a conſiderable town in the iſland of Barbadoes.—*ib.*

OSWEGATCHIE *River* and *Lake*, in Herkemer county, New York. The river empties into the river St Lawrence, or Cataraqui. *Oſwegatchie Lake* is about 19 miles long, from S. W. to N. E. and 7 broad, and ſends its waters north-eaſtward into the river of its name. It is about 10 miles S. E. of The Thouſand Lakes, near the entrance into Lake Ontario. There is a fort of the ſame name, ſituated on the Cataraqui river, 58 miles N. E. of Kingſton, on Lake Ontario.—*ib.*

OSWEGATCHIES, an Indian tribe reſiding at Swagatchey, on the river St Lawrence, in Canada. They could furniſh about 100 warriors, 20 years ſince.—*ib.*

OSWEGO, a navigable river of New York, which conveys the waters of Oneida, and a number of ſmall lakes, into Lake Ontario. It is more commonly called *Onondago*.—*ib.*

Oswego, a fortreſs ſituated on the E. ſide of the mouth of the above river, and ſouth-eaſtern ſide of Lake Ontario, in lat. 43 18 N. and long. 76 30 W. It was taken by the Britiſh from the French in 1756, and confirmed to them by the peace of 1763. It was delivered up to the United States July 14, 1796. It is about 150 or 160 miles E. by N. of Niagara.—*ib.*

OTABALO, a juriſdiction in the province of Quito, joined on the ſouth to that of San Miguel de Ibarra. The lands are laid out in plantations, and produce great quantities of ſugar. The Indians in the villages, as alſo thoſe who are independent, manufacture great variety of cottons, viz. carpets, pavilions for beds, quilts in damaſk work, wholly of cotton, either white, blue, or variegated with different colours; all which are highly valued, both in the province of Quito and Peru, where they are diſpoſed of to great advantage. The wheat and barley here, is ſowed like Indian corn, in little holes, a foot diſtant from each other, putting 5 or 6 corns into each; and they generally reap above an hundred fold. The country is remarkably fertile, and large quantities of cheeſe are made.—*ib.*

OTABALO, the principal village of the above juriſdiction, is large and populous, and ſaid to contain 18,000 or 20,000 ſouls. Among them is a conſiderable number of Spaniards.—*ib.*

OTAHA, one of the Society Iſlands in the S. Pacific Ocean, whoſe north end is in lat. 16 53 ſouth, and long. 151 20 weſt. It has 2 good harbours.—*ib.*

OTAKOOTAI, a ſmall iſland in the S. Pacific Ocean, 4 leagues from Wateeoo, and about 3 miles in circuit. S. lat. 19 15, W. long. 158 23.—*ib.*

OTCHIER, a bay on the north coaſt of S. America, to the weſtward of the river or creek called Urano, and eaſt of Cape Caldero.—*ib.*

OTEAVANOOA, a large and ſpacious harbour and bay on the ſouth-weſt coaſt of the iſland of Bolabola, one of the Society Iſlands. S. lat. 16 30, W. long. 151 43.—*ib.*

OTISFIELD, a plantation in Cumberland county, Diſtrict of Maine, eaſt of Bridgetown in York county, and 152 miles N. N. E. of Boſton. A ſtream from Songo Pond paſſes through the weſterly part of this town, on its way to Sebago. It is very free of ragged hills and mountains. The greateſt part of it affords a growth of beech, maple, aſh, baſs, and birch, and is good land. It contains 197 inhabitants.—*ib.*

OTOGAMIES, an Indian nation in the N. W. Territory, who inhabit between the Lake of the Woods and Miſſiſſippi river. Warriors 300.—*ib.*

OTOQUE, an iſland on the N. Pacific Ocean, or W. coaſt of New-Mexico, ſituated in the Bay of Panama, 17 leagues S. of the city of that name, from whence it is ſupplied with proviſions. N. lat. 7 50, W. long. 81 10.—*ib.*

OTSEGO, a county of New-York, on the S. ſide of Mohawk river, oppoſite the German Flats. The head waters of Suſquehannah, and the Cookquago branch of Delaware, interſect this county. Here are alſo the lakes Otſego, and Caniaderago, which ſend their waters, in an united ſtream, to the Suſquehannah. It contains 9 townſhips, viz. Kortright, Harperſfield, Franklin, Cherry Valley, Dorlach, Richfield, Otſego, Burlington, and Unadilla. It contained, a few years ago, about 1000 inhabitants; but ſuch has been the rapid ſettlement of this county, that in January, 1796, it contained 3237 inhabitants, qualified to be electors. In 1791, when this county was but thinly ſettled, as many as 300 cheſts of maple ſugar, were manufactured here, 400lbs. each. The courts are held at Cooperſtown, in the townſhip of Otſego.—*ib.*

Otsego, a townſhip and lake, in the county above deſcribed. The townſhip was taken from Unadilla, and incorporated in 1796. On the E. the townſhip encloſes Lake Otſego, which ſeparates it from Cherry Valley. Lake Otſego is about 9 miles long, and little more than a mile wide. The lands on its banks are very good, and the cultivation of it eaſy. In 1790, it contained 1702 inhabitants, including 8 ſlaves. By the State cenſus of 1796, there were 490 of its inhabitants electors.—*ib.*

OTTAWAS, an Indian nation in the N. W. Territory, who inhabit the E. ſide of Lake Michigan, 21 miles from Michilimackinack. Their hunting grounds lie between Lakes Michigan and Huron. They could furniſh 200 warriors 20 years ago. A tribe of theſe alſo lived near St Joſeph's, and had 150 warriors. Another tribe lived with the Chippewas, on Saguinam Bay, who together could raiſe 200 warriors. Two of theſe tribes lately hoſtile, ſigned the treaty of peace with the United States, at Greenville, Auguſt 3d, 1795. In conſequence of lands ceded by them to the United States, government has agreed to pay them in goods, 1000 dollars a year, forever.—*ib.*

Ottawas, a large river of Canada, which empties into the St Lawrence at the Lake of the Two Mountains, 9 miles from Montreal. The communication of the city of Montreal with the high lands, by this river, if not impracticable, is at leaſt very expenſive and precarious, by reaſon of its rapids and falls.—*ib.*

OTTER *Bay*, on the ſouth coaſt of the iſland of Newfoundland, is between Bear Bay and Swift Bay, and near Cape Raye, the ſouth-weſt point of the iſland.—*ib.*

Otter *Creek*, called by the French *Riviere a Lotris*, a river of Vermont, which riſes in Bromley, and purſuing a northern direction about 90 miles, empties into Lake Champlain at Ferriſburg; and in its courſe receives about 15 ſmall tributary ſtreams. In it are large falls at Rutland, Pittsford, Middlebury, and Vergennes. Between the falls the water is deep and navigable for the largeſt boats. Veſſels of any burden may go up to the falls at Vergennes, 5 miles from its mouth. The head of this river is not more than 30 feet from Batten Kill, which runs in a contrary direction, and falls into Hudſon's river. Its mouth is 3 miles north of *Baſon Harbour.*—*ib.*

Otter *Creek*, a ſmall ſtream which empties into Kentucky river, in the ſtate of that name, and E. of Boonſborough.—*ib.*

Otter's *Head*, a ſmall peninſula, projecting from the north-eaſtern ſhore of Lake Superior, and north-weſt of Michipicoton Iſland.—*ib.*

OUADELIM and Labdesseba, two tribes of Arabs inhabiting the *Sahara* or Great Deſert of Africa, of whom almoſt nothing was known to Europeans till the publication of Briſſon's narrative of his ſhipwreck and captivity among the latter tribe. He deſcribes the Ouadelim and Labdeſſeba as the moſt formidable of all the interior tribes of Arabs, and as often extending their ravages to the very gates of Morocco. "Their hordes (he ſays) are frequently intermingled with thoſe of the Rouſege, Rathidium, Chelus, Tucanois, and Ouadeli tribes, as they have no diſtinct boundaries, and change their habitations as the deſart affords paſturage and water. They are tall, handſome, ſtout, and vigorous men. Their hair is briſtled, and their nails, which they often uſe in battle, as long as claws; large hanging ears and a long beard give them a ſtern ferocious air. The Ouadelim in particular are fierce, arrogant, and warlike, but ſoon diſpirited by obſtinate reſiſtance, eſpecially when they have not a decided ſuperiority in numbers. In their hordes they lodge by families, in tents which are covered with a thick cloth of camels hair, which the women ſpin and weave upon a loom ſo ſmall, that they work ſitting on the ground. The furniture of their tents conſiſt of two large ſacks of leather, in which they keep old clothes and pieces of old iron, three or four goat ſkins for holding milk and water, two large ſtones for grinding their barley, a ſmaller one for driving the pins of their tents, an ozier matting which ſerves for a bed, a thick carpet for a covering, a ſmall kettle, and ſome wooden diſhes, with pack-ſaddles for their camels. The perſon who, beſides theſe articles, poſſeſſes a few horſes, camels, ſheep, and goats, is reckoned wealthy, as there are many Arabs who only poſſeſs ſheep and goats. Except ſore eyes and the cholic, they are ſubject to few endemic diſeaſes. The firſt diſorder is cauſed by the reflection of light from the burning ſands of the deſart, the other proceeds from the verdigreaſe which contaminates all their victuals. Their kettles are not tinned, and never waſhed, ſo that they are quite cruſted over with verdigreaſe, the virulence of which is probably diminiſhed by the quantity of milk they uſe. When they reſide long in one place, they ſometimes plough the ſpots which are moiſtened by the rain, and ſprinkle them with ſeed in a careleſs manner. Plentiful crops are often thus produced; but inſtead of waiting till the grain attains maturity, they cut it down, and dry it over hot cinders. Treachery and perfidy are the innate vices of the Arabs; aſſaſſinations are frequent; no man truſts the promiſe of another; no man makes a written agreement, as the poignard cancels all bonds and obligations. The men often relate their exploits to each other; the embelliſhing of a ſtory is ſucceeded by a charge of falſehood, and the poignard ſolves every difficulty. The ancient rites of hoſpitality, however, are practiſed among theſe tribes in their utmoſt extent. The Arab, who in the field is a rapacious plunderer, becomes liberal and generous as ſoon as he enters his tent. War is only a ſpecies of rapine, and the victory is decided at the firſt ſhock. The Arab is devoid of ſanguinary courage; he attacks only to plunder, and never thinks that booty is to be put in competition with his life. When the battle is ended, each party makes graves for the ſlain, and encloſe the tombs with mounds of ſtones. The ages of the warriors are denoted by the ſpace of ground which the grave occupies, and the funeral proceſſion is cloſed by the howls of the females.

“ The women never aſſume the name of their huſbands, and never eat with them at meals. They are faithful to their huſbands, and cannot be divorced except by the decree of the ſeniors of the horde. The Arabs diſplay their opulence by the ornaments of their women, whoſe ears, arms, and legs, are generally adorned with rings of gold and ſilver. An Arab beauty muſt have long teeth ſhooting out of her mouth, a body extremely thick, and limbs of the longeſt ſize. At the birth of a ſon, every woman, to teſtify her joy, blackens her face for 40 days. At the birth of a daughter ſhe only daubs the half of her face during the ſpace of 20 days. A mother treats her ſon with the ſame reſpect as her huſband, almoſt as ſoon as he is able to walk; ſhe prepares his food, ſerves him, and eats when he has finiſhed his repaſt. In the education of their young men, the moſt important acquiſitions are, dexterity in the uſe of the poignard, ſkill in embowelling their enemies with their long nails, and a plauſible air in uttering a falſehood. More rude and ferocious than the tribes whoſe territories lie upon the ſhore of the ſea, the Labdeſſeba and Ouadelim Arabs are alſo more confined and illiberal in their ideas, not only believing that they are the firſt nation in the world, but fancying that the ſun riſes only for them. Briſſon relates, that ſome of them expreſſed this idea in unequivocal terms. ‘ Behold (ſaid they) that luminary, which is unknown in thy country. During the night, thou art not enlightened, as we are, by that heavenly body, which regulates our days and our faſts. His children, (the ſtars) point out to us the hours of prayer. You have neither trees nor camels, ſheep, goats, nor dogs. Are your women ſimilar to ours?’ ‘ How long didſt thou remain in the womb of thy mother (ſaid another)?’ ‘ As long (replied Briſſon) as thou in that of thine.’ ‘ Indeed (ſaid a third, counting the fingers and toes of the Frenchman) he is made like us; he differs only in his colour and language.’ ‘ Do you ſow barley in your houſes?’ ſaid the Arabs, alluding to the ſhips of the Europeans. ‘ No (ſaid Briſſon), we ſow our fields almoſt in the ſame ſeaſon as you.’ ‘ How! (cried ſeveral) do you inhabit the earth? we believed that you were born and lived upon the ſea.’ Theſe Arabs, according to the Turkiſh proverb, believe that all the world is like their father's houſe: unacquainted with the manners of other nations, and unaccuſtomed to reflect upon the cauſes of national character, every variation from their own cuſtoms appears not only ridiculous, but monſtrous; every difference of opinion not only abſurd, but criminal. This ignorance of the Arabs, conjoined with their local and religious prejudices, enables us to account for the inſulting treatment which Briſſon and his companions received, without having recourſe to inherent depravity of nature.” That treatment was indeed ſhocking.

Briſſon had ſurrendered himſelf, on his ſhipwreck, to Sidi Mahomet, a *Talbe* or prieſt of the tribe of Labdeſſeba. During the abſence of the prieſt, the Labdeſſeba, who guarded the captives, were attacked and maltreated by a party of the Ouadelims, and during the buſtle which enſued, Briſſon had almoſt loſt his life. Inſtead of compaſſionating his forlorn ſituation, the women threw ſand into his eyes, as they ſaid, to dry his eye-lids. The Arabs, into whoſe hands he had fallen, had only come down to the ſea-coaſt to gather wild grain, three days before the ſhipwreck; and to preſerve their booty, they immediately retreated to the interior part of the deſart. A guide preceded the horde, to place at intervals ſmall pyramids of ſtone, to direct their courſe, at a diſtance from every hoſtile tribe. After paſſing ſome very high mountains, wholly covered with ſmall greyiſh pebbles as ſharp as flints, they deſcended into a ſandy plain overſpread with thorns and thiſtles. When Briſſon was unable to walk, on account of the bleeding of his feet, he was mounted on a camel; the briſtly hair and hard trot of which ſoon excoriated him ſo much, that the blood run copiouſly down its flanks. By throwing heated ſtones into a wooden veſſel, filled with barley meal, diluted with water procured on the ſea-ſhore, preſerved in a goat's ſkin, and mixed with pitch to prevent putrefaction, the Arabs prepared a kind of ſoup, which they kneaded with their hands, and ate unchewed. They roaſted a goat in heated ſand, ate its fat raw, and after having devoured the fleſh, gnawed the bones, and ſcraped them with their nails, threw them to Briſſon and his companions, deſiring them to eat quickly, and load the camels, that the journey might not be impeded. Proceeding eaſtward, they croſſed a vaſt plain, covered with ſmall ſtones white as ſnow, round and flat as a lentil, where not a ſingle plant was produced. The earth beneath their feet reſounded dull and hollow, and the ſmall ſtones pricked them like ſparks of fire. The reflection of the rays of the ſun from the ſand was ſcorching; the atmoſphere was loaded with a red vapour, and the country appeared as if filled with flaming volcanoes. Neither birds nor inſects could be ſeen in the air. The profound ſilence was frightful. If a gentle breeze ever aroſe, it produced extreme langour, chopping of the lips, burning heat of the ſkin, with ſmall ſmarting pimples. This plain was even ſhunned by wild beaſts. After traverſing this plain, they entered another, where the wind had thrown up in furrows the ſand, which was of a reddiſh colour. On the tops of the furrows grew a few ſweet-ſcented plants, which were devoured by the camels. On quitting this ſandy plain, they entered a valley ſurrounded by mountains, where the ſoil was white and ſlimy, and where they found water of a noxious ſmell, covered with green moſs, and ſoon after diſcovered a horde of the friendly tribe Rouſſye.

After another journey of ſixteen days, they arrived at the tents of the Labdeſſeba horde, to which Sidi Mahomet belonged. The tents pitched among thick buſhy trees, and the numerous flocks feeding along the ſides of the hills, preſented at a diſtance an aſpect of happineſs and paſtoral ſimplicity. On approaching near, the trees of beautiful green foliage proved to be only old gummy ſtumps, almoſt void of branches, ſo encircled with thorns that their ſhade was inacceſſible. The women approached, with loud cries and the moſt fawning ſervility, to welcome their tyrants, to throw ſtones at the Chriſtians, and ſpit in their faces, while the children imitated the example of their mothers. Briſſon, who endeavoured to ingratiate himſelf with his maſter's favourite, not only failed in this, but incurred her implacable reſentment, through his irritability, which to the Arab women ſeemed extremely to reſemble petulance. During his reſidence with Sidi Mahomet, the hardſhips he endured were almoſt incredible. With the exceſſive heat, the milk of the ſheep, goats, and camels, diminiſhed, and then the dogs fared better than the Chriſtians, who were forced to ſubſiſt on wild herbs and raw ſnails. When the rains fell, and the leaſt preſſure made the water to ſpring up through the ſandy ſoil, the Chriſtians ſlept behind a buſh, unſheltered, on the bare ground. Briſſon and his maſter ſometimes reaſoned about religion; when the latter always anſwered the harangues of the former by declaring, that he preferred a bowl of churned milk to ſuch abſurdities. Several of his companions periſhed, and were left by the Arabs to be devoured by the ravens, while in the ſtruggles of death. One of them was ſuppoſed to be murdered by his maſter for milking his camels clandeſtinely. An application made by Briſſon to the conſul at Mogador, by a letter entruſted to a Jewiſh merchant was fruſtrated through the negligence of the vice-conſul; and the Labdeſſeba Arabs thought the journey too dangerous to be encountered for the ranſom of their ſlaves. He was however at laſt relieved, through the humanity of his maſter's brother-in-law, who carried him to Morocco, where his ranſom was paid by the Emperor, and whence he returned to France. For a fuller accouut of theſe two ſavage tribes, ſee *Saugnier's and Briſſon's Narratives*; or a very pleaſing *Hiſtorical and Philoſophical Sketch of the Diſcoveries, &c. of the Europeans in Northern and Weſtern Africa*, publiſhed 1799 by *Symington* Edinburgh, and *Vernor* and *Hood* London.

OUAIS's *Bay* and *River*, are about 2 leagues round the north point of the iſland of Cape Breton, in the Gulf of St Lawrence, and ſouth-ſouth-weſt of the iſland of Limbach.—*Morse*.

OUANAMINTHE, a French pariſh and village on the N. ſide of the iſland of St Domingo, about a league and a half W. of Daxabon, in the Spaniſh part, from which it is ſeparated by the river Maſſacre; 6 leagues from the mouth of the river, and 5 S. E. of Fort Dauphin.—*ib.*

OUAQUAPHENOGAW, or *Ekanſanoka* is a lake or rather marſh, between Flint and Oakmulgee rivers, in Georgia, and is nearly 300 miles in circumference. In wet ſeaſons it appears like an inland ſea, and has ſeveral large iſlands of rich land; one of which the preſent generation of Creek Indians repreſent as the moſt bliſsful ſpot on earth. They ſay it is inhabited by a peculiar race of Indians, whoſe women are incomparably beautiful. They tell that this terreſtrial paradiſe has been ſeen by ſome enterprizing hunters, when in purſuit of their game, who being loſt in inextricable ſwamps and bogs, and on the point of periſhing, were unexpectedly relieved by a company of beautiful women, whom they call daughters of the Sun, who kindly gave them ſuch proviſions as they had with them, conſiſting of fruit and corn cakes, and then enjoined them to fly for ſafety to their own country, becauſe their huſbands were fierce men and cruel to ſtrangers. They further ſay that theſe hunters had a view of their ſettlements, ſituated on the elevated banks of an iſland, in a beautiful lake; but in all their endeavours to approach it, they were involved in perpetual labyrinths, and, like enchanted land, ſtill as they imagined they had juſt gained it, it ſeemed to fly before them; and having quitted the deluſive purſuit, they with much difficulty effected a retreat. They tell another ſtory concerning this ſequeſtered country, which ſeems not improbable, which is, that the inhabitants are the poſterity of a fugitive remnant of the ancient *Yamaſes*, who eſcaped maſſacre after a bloody and deciſive battle between them and the Creeks, (who it is certain, conquered and nearly exterminated that once powerful people) and here found an aſylum, remote and ſecure from the fury of their proud conquerors. The rivers St Mary and Sitilla, which fall into the Atlantic, and the beautiful Little St Juan, which empties into the bay of Appalachi at St Mark's, are ſaid, by Bartram, to flow from this lake.—*ib.*

OUASIOTO *Mountains* are ſituated N. W. of the Laurel Mountains in N. Carolina and Virginia. They are 50 or 60 miles wide at the Gap, and 450 in length, N. E. and S. W. They abound in coal, lime, and free-ſtone. Their ſummits are generally covered with good ſoil, and a variety of timber, and the intervale lands are well watered.—*ib.*

OUEPAS, a town on the coaſt of Coſta Rica, on the N. Pacific Ocean, and S. of Carthago.—*ib.*

OUIATANON, a ſmall ſtockaded fort in the N. W. Territory, on the weſtern ſide of the Wabaſh river, in lat. 40 38 N. and long. 87 57 W. and ſaid to be about 130 miles ſoutherly of Fort St Joſeph. This was formerly a French poſt. Thus far the Wabaſh is navigable, 412 miles from its mouth, for batteaux drawing 3 feet water. A ſilver mine has been diſcovered here. The neighbouring Indians are the Kickapoos, Muſquitons, Pyankiſhaws, and a principal part of the Ouiatanons. The whole of theſe tribes could furniſh, about 20 years ago, 1000 warriors. The fertility of ſoil, and diverſity of timber in this country are the ſame as in the vicinity of Poſt St Vincent.—*ib.*

OUINEASKE, or *Shelburne Bay*, on the E. ſide of Lake Champlain, ſets up S. eaſterly through the town of Burlington in Vermont into the northern part of Shelburne.—*ib.*

OUISCONSING, a navigable river of the N. W. Territory, which empties into the Miſſiſſippi in lat. 43 33, and long. 94 8; where are villages of the Sack and Fox tribes of Indians. This river has a communication with Fox river, which, paſſing through Winnebago Lake, enters Puan Bay in Lake Michigan. Between the two rivers there is a portage of only 3 miles. On this river and its branches reſide the Indians of its name. Warriors 300.—*ib.*

OULIONT, a village of the ſtate of New-York, on the poſt road from Hudſon to the Painted Poſt. It is 35 miles W. of Harpersfield, and 50 N. E. of Union, on Suſquehannah river, and lies on the north ſide of a creek of its name which empties into Unadilla river.—*ib.*

OUTER *Buoy*, in Hudſon's Bay, lies in lat. 51 38 N. and 5 leagues eaſt of North Bluff.—*ib.*

Outer *Iſland*, on the coaſt of Labrador, is in the cluſter called St Auguſtine's Square; S. W. of Sandy Iſland, and eaſt of Inner Iſland.—*ib.*

OUTIMACS, a tribe of Indians, in the N. W. Territory, reſiding between Lakes Michigan and St Clair. Warriors 200.—*ib.*

OVEN's MOUTH *Bay*, in the Diſtrict of Maine, lies on the S. ſide of Booth-bay townſhip, in Lincoln county, 12 miles from the ſhire town, and 190 N. by E. of Boſton.—*ib.*

OVID, a townſhip of New-York, in Onondago county. It was incorporated in 1794; is ſeparated from Milton on the E. by Cayuga Lake, and comprehends all the lands in the county on the W. ſide of Seneca Lake. The centre of the townſhip is 20 miles S. of the W. ſide of the ferry on Cayuga Lake. In 1796, there were 107 of its inhabitants qualified to be electors.—*ib.*

OWASCO, a lake, partly in the towns of Aurelius and Scipio, in Onondago county, New York. It is about 11 miles long, and one broad, and communicates with Seneca river on the N. by a ſtream which runs through the town of Brutus. The high road from Kaats' Kill weſtward, paſſes towards Cayuga ferry, near the N. end of the lake.—*ib.*

OWEGO, a poſt-town in Tioga county, New York, on the eaſt branch of the Suſquehannah, 20 miles weſterly of Union, 34 N. E. of Athens, at Tioga Point, and 284 from Philadelphia. In 1796, 170 of its inhabitants were electors.—*ib.*

Owego *Creek*, in Tioga county, ſerves as the eaſt boundary of the townſhip of its name. It has ſeveral ſmall branches which unite and empty through the N. bank of the eaſt branch of Suſquehannah river, about 18½ miles W. of the mouth of Chenengo river.—*ib.*

OUYATOISKA *Bay* and *River*, on the coaſt of Eſquimaux, or N. ſhore of the Gulf of St Lawrence, is to the weſtward of Natachquoin river.—*ib.*

OWHARREE, a harbour on the northern part of the weſt coaſt of Houaheine, one of the Society Iſlands, 25 leagues N. W. by W. of Otaheite Iſland. S. lat. 16 44, W. long. 151 8.—*ib.*

OWL's *Head*, a head land on the W. ſide of Penobſcot Bay, in the Diſtrict of Maine. It has a good harbour on the larboard hand as you go to the eaſtward. The harbour makes with a deep cove; has 4 fathoms water, and a muddy bottom. It is open to the E. to N. and E. N. E. winds; but in all other winds you are ſafe. The tide of flood ſets to the eaſtward, and the tide of ebb S. W. through the Muſcle Ridges.—*ib.*

OXBOW, *Great*, a bend of the river Connecticut, about the middle of the townſhip of Newbury, in Vermont. It contains 450 acres of the fineſt meadow land in New England.—*ib.*

OXFORD, a townſhip in Worceſter county, Maſſachuſetts. It contains 1000 inhabitants; is 11 miles ſouthward of Worceſter, and 54 S. W. of Boſton.—*ib.*

Oxford, a village in Briſtol county, Maſſachuſetts.—*ib.*

Oxford, a pariſh in the northern part of Derby, in Connecticut, containing 140 families; 17 miles N. W. of New Haven.—*ib.*

Oxford, a poſt-town of New York, in Tioga county, 45 miles N. E. of Union, and 20 S. W. of Butternutts. This townſhip, lies between Jericho and Union, and is bounded northerly on Norwich, and weſterly by the tract called the Chenengo Triangle. It was incorporated in 1793. Here is an incorporated academy.—*ib.*

Oxford, a townſhip of New Jerſey, ſituated in Suſſex county, on the eaſt bank of Delaware river, 15 or 20 miles N. E. of Eaſton in Pennſylvania. It contains 1905 inhabitants, including 65 ſlaves.—*ib.*

Oxford, a townſhip of Pennſylvania, ſituated in Philadelphia county. There is one of the ſame name in Cheſter county.—*ib.*

Oxford, a port of entry, on the eaſtern ſhore of Cheſapeak Bay, in Talbot county. Its exports in 1794 amounted to 6,956 dollars. It is 13 miles S. by W. of Eaſton, and about 48 S. E. of Baltimore.—*ib.*

Oxford, a ſmall poſt-town of N. Carolina, 36 miles from Hillſborough, and about 416 from Philadelphia.—*ib.*

OXYGLYCUS cerasus, the name given by the editor of Dalzel's Hiſtory of Dahomy to a very ſingular fruit produced in that country, as well as in ſome other parts of Africa. It reſembles a ſmall olive in every reſpect but the colour; being of a duſky reddiſh hue, changing at the end next the ſtalk to a faint yellow. The pulp is firm, and almoſt inſipid; the ſtone is hard like that of the olive. After having chewed one or more of ſuch berries, and ſpit out or ſwallowed the pulp at pleaſure, a glaſs of vinegar will taſte, to the perſon trying the experiment, like ſweet wine; a lime will ſeem to have the flavour of a very ripe China orange; and the ſame change is produced on other acids, the ordinary effects of which upon the palate is deſtroyed in a very unaccountable manner, without efferveſcence or any ſenſible motion. Indeed, the effect is very different from neutralization, ariſing from the mixture of acid and alkali; ſuch combination producing a neutral ſaline liquor, whilſt this miraculous berry ſeems to convert acids to ſweets. Food or drink, not containing any acid, ſuffer no change by the previous uſe of this fruit; its effect upon acids continues, even after a meal, though in a much ſmaller degree. The natives uſe it to render palatable a kind of gruel called *guddoe*, which is made of bread after it becomes too ſtale for any other purpoſe. They deſcribe it as the fruit of a large tree.

Plants ſix or ſeven inches high were raiſed from this fruit by Mr Dalzel, who tried to carry them from Angola to the botanic garden at St Vincent's; but they died on the paſſage. He preſerved the berries in ſpirits, in ſyrup, and in a dry form; but they loſt their ſingular quality in all thoſe preparations. The plant is an evergreen, and the leaves in this infant ſtate are like thoſe of the olive.

OXY-MURIATIC ACID (See CHEMISTRY-*Index* in this *Suppl.*), is the principal agent in the new proceſs of bleaching (ſee BLEACHING, *Suppl.*); but, till very lately, at leaſt, if not even at preſent, the bleachers were in the practice of adding ſome alkali to the acid, notwithſtanding the ſtrong objections which M. Berthollet made to that addition, and notwithſtanding the proofs urged by Mr. Rupp, that it increaſes the expence of bleaching about 40 *per cent.* The chief reaſon for perſiſting in a practice to which ſuch objections were urged was, that the addition of the alkali deprives the liquor of its ſuffocating effects without deſtroying its bleaching powers. Mr Rupp, however, has contrived the following apparatus, in which may be ſafely uſed the pure oxy-muriatic acid ſimply diſſolved in water, which is at once its cheapeſt and beſt vehicle.

Figure 1. (Plate XLI.) is a ſection of the apparatus. It conſiſts of an oblong deal ciſtern ABCD, made water tight. A rib EE of aſh or beech wood is firmly fixed to the middle of the bottom CD, being mortiſed into the ends of the ciſtern. This rib is provided with holes at FF, in which two perpendicular axes are to turn. The lid AB has a rim GG, which ſinks and fits into the ciſtern. Two tubes HH are fixed into the lid, their centres being perpendicularly over the centres of the ſockets FF when the lid is upon the ciſtern. At I, is a tube by which the liquor is introduced into the apparatus. As it is neceſſary that the ſpace within the rim GG be air-tight, its joints to the lid, and the joints of the tubes, muſt be very cloſe; and if neceſſary ſecured with pitch. Two perpendicular axes KL, made of aſh or beech wood paſs thro' the tubes HH, and reſt in the ſockets FF. A piece of ſtrong canvas M is ſewed very tight round the axis K, one end of it projecting from the axis. The other axis is provided with a ſimilar piece of canvas. N are pieces of cloth rolled upon the axis L. Two plain pulleys OO are fixed to the axes, in order to prevent the cloth from ſlipping down. The ſhafts are turned by a moveable handle P. Q is a moveable pulley, round which paſſes the cord R. This cord, which is faſtened on the oppoſite ſide of the lid (ſee fig. 2.), and paſſes over the ſmall pulley S, produces friction by means of the weight T. By the ſpigot and fauſſet V, the liquor is let off when exhauſted.

The dimenſions of this apparatus are calculated for the purpoſe of bleaching twelve or fifteen pieces of $\frac{4}{4}$ callicoes, or any other ſtuffs of equal breadth and ſubſtance. When the goods are ready for bleaching, the axis L is placed on a frame in an horizontal poſition, and one of the pieces N being faſtened to the canvas M by means of wooden ſkewers, in the manner repreſented in fig. 1. it is rolled upon the axis by turning it with the handle P. This operation muſt be performed by two perſons; the one turning the axis and the other directing the piece, which muſt be rolled on very tight and very even. When the firſt piece is on the axis, the next piece is faſtened to the end of it by ſkewers, and wound on in the ſame manner as the firſt. The ſame method is purſued till all the pieces are wound upon the axis. The end of the laſt piece is then faſtened to the canavs of the axis K. Both axesare afterwards placed into the ciſtern, with their ends in the ſockets FF, and the lid is put on the ciſtern by paſſing the axes through the tubes HH. The handle P is put upon the empty axis, and the pulley Q upon the axis on which the cloth is rolled, and the cord R, with the weight T, is put round it and over the pulley S. The uſe of the friction, produced by this weight is to make the cloth wind tight upon the other axis. But as the effect of the weight will increaſe as one cylinder increaſes and the other leſſens, Mr Rupp recommends that three or four weights be ſuſpended on the cord, which may be taken off gradually as the perſon who works the machine may find it convenient. As the weights hang in open hooks, which are faſtened to the cord, it will be little or no trouble to put them on and to remove them.

Things being thus diſpoſed, the bleaching liquor is to be transferred from the veſſels in which it has been prepared into the apparatus, by a moveable tube paſſing through the tube I, and deſcending to the bottom of the ciſtern. This tube being connected with the veſſels, by means of leaden or wooden pipes provided with cocks, hardly any vapours will eſcape in the transfer. When the apparatus is filled up to the line *a*, the moveable tube is to be withdrawn, and the tube I cloſed. As the liquor riſes above the edge of the rim G, and above the tubes HH, it is evident that no evaporation can take place, except where the rim does not apply cloſely to the ſides of the box; which will, however, form a very trifling ſurface if the carpenter's work be decently done. The cloth is now to be wound from the axis L upon the axis K, by turning this; and when this is accompliſhed, the handle P and pulley Q are to be changed, and the cloth is to be wound back upon the axis L. This operation is, of courſe, to be repeated as often as neceſſary. It is plain, that by this proceſs of winding the cloth from one axis upon the other, every part of it is expoſed, in the moſt complete manner, to the action of the liquor in which it is immerſed. It will be neceſſary to turn, at firſt, very briſkly, not only becauſe the liquour is then the ſtrongeſt, but alſo becauſe it requires a number of revolutions, when the axis is bare, to move a certain length of cloth in a given time, though this may be performed by a ſingle revolution when the axis is filled. Experience muſt teach how long the goods are to be worked; nor can any rule be given reſpecting the quantity and ſtrength of the liquor, in order to bleach a certain number of pieces. An intelligent workman will ſoon attain a ſufficient knowledge of theſe points. It is hardly neceſſary to obſerve, that, if the liquor ſhould retain any ſtrength after a ſet of pieces are bleached with it, it may again be employed for another ſet.

With a few alterations, this apparatus might be made applicable to the bleaching of yarn. If, for inſtance, the pulley O were removed from the end of the axis K, and fixed immediately under the tube H;—if it were perforated in all directions, and tapes or ſtrings paſſed through the holes, ſkains of yarn might be tied to theſe tapes underneath the pulley, ſo as to hang down towards the bottom of the box. The apparatus being afterwards filled with bleaching liquor, and the axis turned, the motion would cauſe every thread to be acted upon by the liquor. Several axes might thus be turned in the ſame box, and being connected with each other by pulleys, they might all be worked by one perſon at the ſame time; and as all would turn the ſame way and with the ſame ſpeed, the ſkains could not poſſibly entangle each other.

OYSTER *Bay*, a townſhip of New-York, ſituated in Queen's county, Long-Iſland, extending from the Sound S. to the Atlantic Ocean, and includes Loyd's Neck, or Queen's Village, and Hog-Iſland. It contains 4,097 inhabitants; of whom 611 are electors, and 381 ſlaves.—*Morſe.*

Oyster *Bay*, a harbour for ſmall veſſels in the S. W. limits of the town of Barnſtable, in Barnſtable county, Maſſachuſetts. It affords excellent oyſters; hence its name.—*ib.*

Oyster *Beds*, in Delaware Bay, lie oppoſite Nantuxet Bay.—*ib.*

Oyster *Point*, on the coaſt of S. Carolina, where the water does not ebb till an hour and a half after it begins to ebb at the bar of Aſhley river, near Charleſton. It is beſt to go in an hour and an half before high water.—*ib.*

Oyster *Pond*, a part of the waters of the Atlantic Ocean, which ſet up weſtward into Long-Iſland, in the State of New-York, between the north-eaſternmoſt point of the iſland called Oyſter Pond Point, and Gardner's Iſland. Off the point are two ſmall iſles, one of which is called Plumb-Iſland.—*ib.*

Oyster *River*, a W. branch of Piſcataqua river in New-Hampſhire. Durham ſtands on its S. ſide, near its junction with the main ſtream at Helton's Point.—*ib.*

O-YONG-WONGEYK, on Lake Ontario, at Johnſon's Landing-Place, about 4 miles eaſtward of Fort Niagara.—*ib.*

OZAMA, one of the largeſt rivers of the iſland of St Domingo, in the Weſt-Indies, and on which the city of St Domingo is ſituated. It is navigable 9 or 10 leagues from S. to N. One may judge of the enormous volume of water which the confluent ſtream of Iſabella and Ozama ſends to the ſea, by the red colour it gives it in the time of the floods, and which is perceivable as far as the eye can diſtinguiſh. There is a rock at the mouth, which prevents the entrance of veſſels drawing more than 18 or 20 feet of water. The river for a league is 24 feet deep; and its banks are 20 feet perpendicular, but N. of the city this height is reduced to 4 feet. This real natural baſon has a bottom of mud or ſoft ſand, with a number of careening places. It ſeldom overflows its banks; except in very extraordinary inundations. The road before the mouth of the Ozama is very indifferent, and lies expoſed from W. S. W. to E. It is impoſſible to anchor in it in the time of the ſouth winds, and the north winds drive the veſſels from their moorings out into the ſea, which here runs extremely high. The mouth of the river is in lat. 18 18 N. and long. from Paris 72 38 W.—*ib.*

P.

PABLO, *St*, a lake in the juriſdiction of Otabalo, in the province of Quito, 3 leagues in length, and about half a league in breadth. The lake is every where ſurrounded with a ſpecies of ruſhes called Totoral, among which are vaſt numbers of wild geeſe and galarettes. Its waters empty into the Rio Blanco. —*Morſe.*

Pablo, *St*, a village on the above lake, inhabited principally by Indians.—*ib.*

Pablo, *St*, a town on the S. coaſt of the Iſthmus of Darien, in the province of Veragua, S. America. —*ib.*

PACAJES, a province of S. America, which is rich in ſilver mines, though they are not much worked. Here are alſo mines of talc, called Jaſpes Blancos de Verenguela, on account of their tranſparent whiteneſs. In this province are an abundance of emeralds. —*ib.*

PACAMORES, a diſtrict of Peru, in S. America. The air is temperate, and the earth abounds in gold. An Indian nation of this name inhabit the banks of Amazon river.—*ib.*

PACAYITA, a volcano in Guatimala, in New-Spain. In 1773 the lava which iſſued from it deſtroyed the city of St Jago, which was ſituated in the valley of Panchoi.—*ib.*

PACHACAMA, or *Pachamac*, a famous, fruitful, and pleaſant valley in Peru, 4 leagues from Lima, formerly beautified with a magnificent temple built by the Incas, and dedicated to the Creator of the Univerſe. The Peruvians had in it ſeveral idols; but they had ſo great a reverence for God, whom they called Pachacamac, that they offered him what they eſteemed moſt precious, and durſt not look upon him; ſo that their kings and prieſts entered his temple with their backs towards his altar, and came out again without daring to turn about. The ruins of this ſuperb ſtructure, ſays Jovet, do yet demonſtrate its former magnificence and greatneſs. Such immenſe treaſures had been laid up in it, that Ferdinand Pizarro found to the value of 900,000 ducats in it; although 400 Indians had taken away as much as they could carry; and the Spaniſh ſoldiers pillaged it before he came. The cruel Spaniards tortured the natives, but could not extract a diſcovery of the hidden treaſure.—*ib.*

PACHEA, the moſt northerly of the iſlands called the Pearl or King's Iſlands, all low and woody, and about 12 leagues from Panama. Within a league of this iſland there is anchorage in 17 fathoms.—*ib.*

PACHEGOIA, a lake of New South Wales, in N. America, in lat. 55 N.—*ib.*

PACHEQUE, a fine, but ſmall iſland on the S. W. ſide of the bay of Panama, on the coaſt of the N. Pacific Ocean, and one of the beautiful iſlands within the ſemicircular bay from Panama to Point Mala. Theſe iſlands yield wood, water, fruit, fowls, hogs, &c. and afford excellent harbour for ſhipping.—*ib.*

PACHUCO, a town of Mexico famous for the ſilver mines in its vicinity. It is ſaid that within 20 miles there are 1000 of them. It lies 60 miles from the city of Mexico.—*ib.*

PACKERSFIELD, a townſhip of New-Hampſhire, Cheſhire county, E. of Keene, on the head branches of Aſhuelot river. It is 86 miles weſterly of Portſmouth, was incorporated in 1774, and contains 721 inhabitants.—*ib.*

PACMOTE, a bay on the eaſt ſide of the iſland of Martinico, between Vauclin Bay on the north, and Fere Ance or Creek on the ſouth.—*ib.*

PACOLET, a ſmall river of South Carolina, which riſes in the White Oak Mountains, and unites with Broad river, 30 miles above Tyger river, and 24 ſouth of the North Carolina line. Its courſe is about ſouth-eaſt, and on it are the celebrated Pacolet Springs, 17 miles above its confluence with Broad river.—*ib.*

PADOUCAS, a weſtern branch of Miſſouri river. The tribe of Indians of this name are ſaid by ſome to be of Welch origin.—*ib.*

PAGET's *Port*, a ſmall harbour within the great ſound in the Bahama Iſlands, and in the moſt eaſterly part of the ſound.—*ib.*

PAGUISA, or *Paquiſa*, on the weſt ſide of South-America, in lat. 21 55 S. and 10 leagues north of the harbour of Cobija, in the bay of Atacama. Haguey de Paguiſa, or the watering place of Paguiſa, is 15 leagues from Cobija. The whole coaſt between is high, mountainous and rocky, in the direction of north-north-eaſt.—*ib.*

PAINTED *Poſt*, a ſtation, ſo called in New-York State, in Tioga county, on the northern ſide of Tioga river, between Bath and Newtown; 40 miles N. W. by W. of Tioga Point, or Athens, 58 ſouth-eaſt of Williamſburg on Geneſſee river, and 230 N. W. of Philadelphia. A poſt-office is kept here.—*ib.*

PAINTED *Rock* is on French Broad river, by which the line runs between Virginia and Tenneſſee.—*ib.*

PAINTER's *Harbour*, on the weſt coaſt of Cape Breton Iſland, is nearly due eaſt of Eaſt Point in the iſland of St John's. N. lat. 46 22, W. long. 61 16.—*ib.*

ENCAUSTIC PAINTING is an art of very high antiquity, which, after being loſt for many ages, was reſtored, as is commonly believed, by the celebrated Count Caylus, whoſe method was greatly improved, firſt by Mr Joſiah Colebrooke, and afterwards by Miſs Greenland, who brought the rudiments of her knowledge from Italy (See ENCAUSTIC, *Encycl.*). In that country encauſtic painting had employed the attention of various artiſts and men of learning, ſuch as Requeno, Lorgna, and Aſtori, &c.; but the beſt account of it that has fallen under our notice, is in that valuable miſcellany called the *Philoſophical Magazine*, taken from a work of Giov. Fabbroni, publiſhed at Rome in the year 1797.

According to this author, "the knowledge and uſe of encauſtic painting is certainly older than the time of the Greeks and the Romans, to whom the learned Requeno ſeems to aſſign the excluſive poſſeſſion of this art; becauſe the Egyptians, who, with the Etruſcans, were the parents of the greater part of the inventions known among mankind, and from whom the Greeks learned ſo much, were acquainted with and employed encauſtic painting in the ancient ages of their greatneſs and ſplendour, as is proved by the valuable fragments of the bandages and coverings of ſome mummies which he had examined. No oil-painting (he ſays), of only two or three hundred years old, exhibits a white paint which has kept ſo well as that ſeen on theſe fragments; and this circumſtance ſufficiently proves the ſuperiority of the encauſtic method over the common oil-painting, which, notwithſtanding the general opinion, cannot, he thinks, have been unknown to the ancients.

"It is impoſſible (ſays he) that in Egypt and Phœnicia, where ſo much uſe was made of flax, the oil procured in abundance from that plant ſhould have been unknown. Thoſe who have kept oil, or who have ſpilt any of it, whether nut or lintſeed oil, muſt have remarked that it poſſeſſes the property of ſoon drying by the effects of the atmoſphere; and therefore it may be eaſily believed that mankind muſt ſoon have conceived the idea of employing it, particularly for ſhips, which, as Herodotus ſays, were painted with red ochre in the earlieſt periods, and adorned with figures and ornaments. The uſe of oil afforded painting a much ſimpler and eaſier method than that of wax; it muſt therefore have been firſt adopted, and the tranſition from oil to wax muſt be conſidered as a ſtep towards bringing the art to perfection; becauſe encauſtic painting is not expoſed to the irremediable inconveniences that ariſe in oil-painting, the value of which we extolled through ignorance, and praiſed as a new invention.

"Oil in general, and in particular drying oil which the painters uſe, has naturally a ſtrong inclination to combine itſelf with the vital air or oxygen of the atmoſphere, and by imbibing oxygen it becomes dry, and aſſumes the character of reſin; but the colour then becomes darker, as is the caſe with tranſparent turpentine, which gradually becomes a black pitch.

"According to the new and more accurate method of decompoſing bodies, oil conſiſts principally of hydrogen and carbon. By coming into contact with the atmoſphere, and abſorbing its oxygen and light, it undergoes a ſlow and imperceptible combuſtion, which is not eſſentially different from the ſpeedy and violent one which it would undergo in the common mode of burning. It firſt paſſes, by imbibing oxygen, into the ſtate of a more or leſs dark reſin ; loſes gradually its eſſential hydrogen, which makes a new combination, and afterwards the oxygen itſelf which has attracted the carbon ; and at length leaves behind a thin layer of actual carbon, which in the end becomes black in the courſe of time, and conſiderably obſcures the oil-painting. By a continuance of the before-mentioned ſlow combuſtion, the carbon itſelf, as it were, burns alſo : if it be ſtrongly acted upon by the light, it attracts the oxygen of the atmoſphere, and again brings forward the carbonic acid or fixed air, which gradually flies off. By this, which I may call the ſecond degree of combuſtion, the painting muſt become duſty and friable, like crayon *painting*.

" Hence it appears (ſays our author) that one can hope only for a tranſient or deceitful effect from the refreſhing of oil-paintings with oil ; becauſe the harmony of the tones, which the painter eſtabliſhes as ſuited for the moment, does not proceed with equal ſteps, and cannot preſerve itſelf in the like meaſure for the courſe of a few years, as each tint, as they ſay, ought to increaſe, or, to ſpeak more properly, to burn in proportion to its antiquity. It thence follows, that mere waſhing may be prejudicial to an old painting ; and that the method of refreſhing paintings, as it is called, by daubing over the ſurface, from time to time, with new drying oil, is highly prejudicial and ill calculated for the intended purpoſe, ſince the oil when it becomes dry contracts in its whole ſurface, carries with it the paint under it, and occaſions cracks in the painting. New oil of this kind gives occaſion to mineral paints to be reſtored ; but covers the picture with a new coat of reſin, and then of carbon, which ariſes from the gradual combuſtion, and always cauſes more blackneſs, and the decay of the painting which one wiſhes to preſerve.

" Wax, on the other hand, undergoes a change which is very different from that of drying oil. The wax, inſtead of becoming black by the contact of the atmoſphere, increaſes in whiteneſs, and, according to its natural quality, is not decompoſed in the air, and it does not ſtrongly attract the oxygen of the calces or metallic aſhes which are commonly uſed in painting. Moreover, the ſo called earths, which are in themſelves white, and are never variable either by the preſence or abſence of oxygen, cannot be employed in oil-painting, becauſe that fluid makes them almoſt tranſparent, and cauſes them to remain as it were without body, and not to produce the wiſhed-for effect. That beautiful white, which may be obſerved on the before-mentioned Egyptian encauſtic, is nothing elſe than a ſimple earth, and according to our author's chemical experiments, a chalk which is alſo unalterable."

That the ancients were once acquainted with the uſe of oil-painting, and neglected it on account of the great ſuperiority of the encauſtic method, our author thinks farther evident from the different accounts which we have of the ancient paintings. " Thus Petronius praiſes the freſh appearance which the valuable works of Zeuxis and Apelles had, even in this time ; but Cicero, on the other hand, ſpeaks of the paintings of the ancients having ſuffered from blackneſs. The former ſpeaks of wax-painting, and the latter certainly alludes to paintings in oil. It is well known that paintings with wet chalks or water colours do not become black by age, and that this is the caſe alſo with encauſtic. Of this any one may be convinced, not only by the expreſſions of the above quoted authors, but by one's own eyes on ſurveying the Egyptian fragment alluded to. Galland proves, on various grounds, that a painting was made with oil ſo early as the reign of Marcus Aurelius ; and if no ſpecimens of that period have reached us, this is perhaps to be aſcribed to the frail and periſhable nature of this ſpecies of painting."

Sign. Fabbroni, after ſome farther obſervations, calculated to prove that metallic oxyds or calces could not have been employed as pigments on ſuch mummies as ſtill retain their colours freſh, proceeds thus : " Thoſe who are acquainted with the accuracy and certainty of the method not long ſince introduced into chemical operations, will be convinced, that in 24 grains of the encauſtic painting, which I ventured to detach from the above-mentioned Egyptian fragment, in order to ſubject it to examination, the mixture of an hundredth part of a foreign ſubſtance would have been diſcovered with the greateſt certainty ; that the reſin of Requeno muſt undoubtedly have been perceptible to me, and that the alkali of Bachelier and Lorgna could not have eſcaped the counteracting medium. But in this Egyptian encauſtic I found nothing except very pure wax, though I varied my analyſis in every known method. I muſt therefore conclude, that modern learned writers, at leaſt in reſpect to this Egyptian mode of painting, were as far from the truth as the accounts of ancient authors appear to me preciſe and ſatisfactory ; and that the encauſtum with which formerly the fore part of ſhips and the walls of houſes and temples were painted, was ſomething different from ſoap or reſinous crayons.

" I am well aware that it will be aſked, In what manner can wax at preſent be rendered ſufficiently liquid for the ſtrokes of the pencil, if it be not converted into powder or ſoap ? This queſtion, in my opinion, can be fully anſwered from the words of an ancient author, and, in the next place, by experience.

" Vitruvius in particular, book vii. chap. ix. expreſſes himſelf in the following clear manner :

' Thoſe (ſays he) who wiſh to retain cinnabar on walls, cover it, when it has been well laid on and dried, with Punic wax diluted in a little oil (let this be well remarked) ; and after they have ſpread out the wax with a hair bruſh, they heat the wall by means of a brazier filled with burning coals (hence it is called encauſtic painting), and then make it ſmooth and level by rubbing it with wax tapers and clean cloths, as is done when marble ſtatues are covered with wax. The effect of this wax cruſt is, that the colour is not deſtroyed by the light of the ſun or the moon (A).'

" It here appears, that the Romans, who copied the Grecian proceſs, which the latter borrowed from the Egyptians, mixed the wax with an oil to make it pliable under the bruſh ; but no maſtic, alkali, or honey, as has been ingeniouſly imagined, and which ſome have thought might be employed with ſucceſs. The difficulty

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(A) The reader will find the original of this paſſage, with a tranſlation ſomewhat different, in the article ENCAUSTIC, *Encycl.*

culty now will be confined to point out in what manner this oil was employed. It does not appear that they uſed thoſe fat oils which are commonly called drying oils; becauſe they could have employed theſe as we do, without the addition of wax, which, in ſuch a caſe, would have been entirely ſuperfluous. Fat oils which do not dry would not have been proper for that purpoſe, as they would have kept the wax continually in the ſtate of a ſoft pomade or ſalve. Beſides, my experiments (continues the author) would without doubt have ſhewn me the exiſtence of any oily matter.

"With regard to eſſential or volatile oils, a knowledge of them is not allowed to the ancients, as the invention of diſtilling is not older than the eighth or ninth century, and therefore falls in with the period of Geber or Avicenna." Yet it is certain, that, in order to uſe wax in their encauſtic painting, they muſt have combined it with an ethereal volatile oil, of which no traces ſhould afterwards remain; becauſe this was neceſſary for the ſolidity of the work, and becauſe no oil was found in the fragment that was examined. But naphtha is ſuch an oil, much lighter (ſays our author) than ether of vitriol itſelf. It is exceedingly volatile, and evaporates without leaving a trace of it behind. On this account it is uſed when ſignatures and manuſcripts are to be copied; becauſe the paper, which is moiſtened by it, and ſo rendered tranſparent, quickly becomes white and opaque as before by the complete evaporation of the naphtha. That the Aſſyrians, Chaldeans, and Perſians, were well acquainted with the properties of naphtha is known to every ſcholar; and hence our author thinks it highly probable that it was uſed by thoſe nations to render wax fit for painting. "It appears to me (ſays he) that the Greeks, as was the caſe with many other things, learned encauſtic from the Egyptians, who probably derived it from the Aſſyrians or Chaldeans; and if ſo, we have diſcovered the real mixture uſed for ancient encauſtic painting."

To put the matter, however, beyond a doubt, Sign. Fabbroni prepared, for an eminent Saxon painter, a ſolution of Venetian wax in highly purified naphtha, deſiring him to mix up with it the colours neceſſary for a painting. The artiſt complied; and both he and our author were aſtoniſhed, as well as all their friends, at the high tone which the colours aſſumed, and the agreeable luſtre which the painting afterwards acquired when it had been rubbed over with a ſoft cloth. A ſimilar ſolution of wax was made for another artiſt, in which the ſpirit of turpentine was uſed inſtead of naphtha with equal ſucceſs. Our author therefore concludes, we think with reaſon, that if he has not diſcovered the real compoſition employed by the ancients in their encauſtic paintings, he has at leaſt approached much nearer to that diſcovery than any of his predeceſſors who have employed their learned labours in the ſame field of inveſtigation.

PAINTINGS, or PICTURES, are often done upon objects from which, when they are valuable, it would be deſirable to transfer them. Thus, a connoiſſeur in painting might naturally wiſh to transfer an old and valuable picture from the ceiling or walls of his room to ſtretched canvas; and ſuch a man would conſider himſelf as deeply indebted to the artiſt who ſhould perform ſo arduous a taſk. This taſk has actually been performed by Mr *Robert Salmon* of Woburn, Bedfordſhire, who was honoured by the *Society for the Encouragement of Arts, &c.* with the greater ſilver pallet, for communicating the method by which he accompliſhed it.

"The firſt thing (ſays Mr Salmon) to be attended to with reſpect to paintings, either on plaſtered walls or ceilings, or on boards, is, that the place in which they are be ſecure from wet or damp. If the paintings are on old walls in large builings, or other places where this cannot be attained by art, then the ſummer ſeaſon ſhould be taken for the purpoſe, as the picture will rarely eſcape damage, if wet or damp gets at it while under the proceſs. At the ſame time, care ſhould be taken that the room, or other place, be not overheated; as that would produce equally bad effects.

"Theſe precautions being taken, the next thing is to examine the ſurface of the painting. If there are any holes in the ſame, they muſt be carefully filled up with a paſte or putty, made of glue and whiting: this, if the holes are large, ſhould be twice or thrice done, ſo as entirely to fill them up, and leave the ſurface even and ſmooth; but if there are any bruiſed places, with paint ſtill remaining on the ſurface of the bruiſed parts, then this ſtopping muſt not be applied, but the ſecuring-canvas, hereafter deſcribed, muſt be preſſed down into theſe places. In the places that are ſtopped, there will of courſe appear blemiſhes when the picture is transferred; but the proceſs is rendered much more certain and ſure by being ſo done. Attention muſt next be paid to lay down any bliſters, or places where the paint is leaving the ground: this is done by introducing, between the paint and the ground, ſome very ſtrong paſte of flour and water; and the ſurface of the bliſtered paint being damped with a wet ſponge or bruſh, it may be preſſed with the hand home to the ground, to which it will then adhere.

"All the unſound places being thus ſecured, care muſt be taken to clear the ſurface of any greaſe or dirt, as alſo of any particles of the paſte that may happen to be left on it. The next thing is, to determine the ſize of the painting meant to be taken off: If it is on a plain ſurface, a board of the ſize of the picture muſt be procured, not leſs than an inch in thickneſs, and framed together with well ſeaſoned wood, in ſmall pannels, ſmooth and fluſh on one ſide. This done, a piece of fine open canvas muſt be provided, ſuch as the fineſt ſort uſed for hanging paper on; which canvas is to be ſomewhat larger than the picture, and ſo ſewed together, and the ſeam ſo preſſed, that it be perfectly ſmooth and even. This is what Mr Salmon calls the ſecuring canvas; which, being ſo prepared, is to be ſtuck on the ſurface of the picture with a paſte made of ſtrong beer, boiled till it is half reduced, and then mixed with a ſufficient quantity of flour to give it a very ſtrong conſiſtence. To large pictures on walls or ceilings, the canvas muſt for ſome time be preſſed, and rubbed with the hand as ſmooth as poſſible, working it from the middle to the outſide, ſo as to make it tolerably tight; obſerving, as it dries, to preſs it, with the hand or a cloth, into any hollow or bruiſed places, ſo that it may adhere to every part of the painting: this done, it is left to dry, which it will generally do in a day or two. When dry, a ſecond canvas, of a ſtronger and cloſer ſort, and of the ſame ſize as the other, is in like manner to be attached on the top of the firſt. This laſt will want very little attention, as it will readily adhere to the firſt; and, being dry, attention muſt be paid to take off any ſmall knots or unevenneſs that may be upon the ſurface of it; which done, the whole ſhould be again covered with a thin paſte of ſize and whiting; which is to be pumiced over when dry, ſo as to make the whole perfectly ſmooth and even.

“ The painting being thus ſecured, the board, already prepared to the ſize of the picture, is to be put with the ſmooth ſide againſt the ſurface thereof, ſo as exactly to cover as much as is intended to be transferred. The edges of the canvas, which, as before directed, is to be larger than the painting, are then to be pulled tight over, and cloſely nailed to the edge of the board. If the painting is large, and either on a ceiling or wall, the board muſt, by proper ſupports, be firmly fixed againſt it, ſo that it can readily be lowered down when the plaſter and painting are detached.

“ The canvas and board being fixed, the painting is to be freed from the wall or ceiling, together with a certain portion of the plaſtering: this, with proper care and attention, may be readily done. If on a ceiling, the firſt thing is to make ſome holes through the plaſtering, round the outſide of the board and painting; and, with a ſmall ſaw, to ſaw the plaſtering from one hole to another, till the whole is diſunited from the other parts of the ceiling: this done, the workman muſt get at the upper ſide of the ceiling, where he muſt free the plaſtering from the laths, by breaking off the keys thereof, and with a chiſel cut out the laths; whereby the plaſtering, together with the picture, will be left reſting on the board and ſupports.

“ If the painting is on a brick or ſtone wall, the wall muſt be cut away at top, and down the ſides of the painting; and then, by means of chiſels or ſaws in wooden handles, of different lengths, the wall muſt be cut away quite behind the painting; leaving the ſame, together with the plaſtering, reſting on the board. This operation may ſometimes be done with a ſaw; or, if the wall be not thick, nor the other ſide of much conſequence, the bricks or ſtones may be taken out from that ſide, leaving the plaſtering and painting as before. This laſt method (ſays the author) I have not practiſed: the other, of cutting away ſome part of the wall, I have, and ſee no difficulty, or very great labour, in the operation; but that, of courſe, muſt be various, according to the texture of the wall and mortar.

“ If the paintings are on curved ſurfaces, ſuch as the coves of ceilings, then the only difference of operation is, that ſome ribs of wood muſt be cut out, and boarded ſmooth to the curve of the ſurface of the painting, and then fixed up thereto, in place of the before-deſcribed bearing-board; the painting is then to be freed, and left with the plaſtering, reſting on the bearers.

“ For paintings on wainſcot or boards, the ſame ſecuring and proceſs is to be exactly followed; only that, as the wainſcot or board can always be cut to the ſize wanted, and laid horizontal, the ſecuring canvas is to be ſtretched thereon, and turned over the edges of the ſame, till it is dry; after which the edges are again to be turned up, and nailed to the board, in the ſame manner as with reſpect to paintings from walls.

“ Having, as before deſcribed, in any of the aforementioned caſes, freed the paintings from their original places, you have got them ſecured to two thickneſſes of canvas, with their ſurfaces on the board prepared for that purpoſe; this being the caſe, they can readily be removed to any room or ſhop, to be finiſhed as follows: Having carried the painting into the ſhop or room, which ſhould be moderately warm and dry, but by no means overheated, lay the board on a bench or treſſels, ſo that the back of the picture be uppermoſt, the plaſtering or wood, as may happen, is then to be cleared away, leaving nothing but the body of paint, which will be firmly attached to the ſecuring canvas. To perform this, a large raſp, a narrow plane, and chiſels, will be requiſite. This operation, though difficult to be deſcribed, would ſoon be learned by any one who ſhould make the attempt; nor is it very tedious; and being performed, the picture is ready to be attached to its new canvas, as follows.

“ The painting being cleared, and lying on the board, the back thereof is to be painted three or four times over ſucceſſively, with any good ſtrong-bodied paint; leaving one coat to dry before another comes on: a day or two between each will generally be found ſufficient. Each of theſe coats, and particularly the firſt, ſhould be laid on with great care, taking but a ſmall quantity in the bruſh at a time, and laying it very thin. This precaution is neceſſary, to prevent any of the oil or paint from paſſing through any ſmall cracks or holes in the ſurface of the picture; as ſuch oil or paint would run into the paſte, and ſo attach the ſecuring canvas to the picture, as to prevent its being afterwards got off. If any ſuch holes or cracks are obſerved, they ſhould be ſtopped up with the glue and whiting paſte, and the painting then repeated, till a complete coat is formed on the back of the picture. It is then ready for attaching to its canvas, which is done by ſpreading all over the picture a paſte made of copal varniſh, mixed with ſtiff white lead, and a ſmall quantity of any other old fat paint; all which being ſpread equally over with a pallet knife, ſuch a canvas as the firſt ſecuring canvas is laid thereon, and ſtrained and nailed round the edges of the board; in which ſtate it is left till it becomes tolerably dry: then a ſecond canvas, of a ſtronger ſort, muſt be in like manner attached on the firſt, and left till it is perfectly dry and hard. This generally takes about two months; and the longer the painting is left, the more ſecurely it will be attached to its canvas, and leſs liable to crack or fly therefrom. When ſufficiently dry, all the four canvaſſes are to be unnailed from the board, and the edges turned up the reverſe way, and nailed to a proper ſtretching-frame. This is done by unnailing from the board a part on each ſide at a time, and immediately nailing it to the ſtretching-frame, ſo as never to leave the canvas to crack or partially ſtretch, which would damage the picture. In this manner, by degrees, the cloths are entirely detached from the board, and firmly fixed on the ſtretching-frame. The ſuperflous canvas, left larger than the frame, may then be cut off, and the wedges put in the frame, and moderately tightened up. There remains then only to clear the ſurface of the painting from the ſecuring-canvas; which is done by repeatedly waſhing the ſurface with a ſponge and moderately warm water. In doing this, no violence or force muſt be uſed; and, by frequent and gentle waſhings, the paſte will all be worked out with the ſponge. The edges of the outer canvas are then to be cut round, and ſtripped off: the other, next the ſurface of the picture, is to be ſerved in like manner;

which done, nothing remains but to take the paſte clean off, and repair any defects: the picture will then be as ſtrong as if painted on the canvas.

“ For taking pictures off walls, without taking the walls down, or cutting away more thereof than the plaſtering, the following proceſs is propoſed:

“ The ſurface of the picture is to be firſt ſecured, in the manner before deſcribed; but inſtead of the plain board, a bearer ſhould be prepared with a convex ſurface, compoſed of ribs, boarded over, ſo as to form part of a cylinder, of not leſs than five feet radius, and as long as the height of the picture. This bearer being prepared, in order to apply it, a floor or platform ſhould be erected, and placed horizontally, with its ſurface level, and its edge immediately in contact with the bottom of the picture meant to be transferred. The uſe of this platform is for the above deſcribed bearer to reſt and move upon; which bearer ſhould be ſet on its end, with one edge in contact with the wall, at one ſide of the picture; conſequently the other edge will be at ſome diſtance from the wall, according to the ſize of the picture and convexity of the bearer. Being thus placed, the ſuperfluous edge of the ſecuring-canvas ſhould be turned over, and nailed to that edge of the bearer that is next the wall: This done, the operation of cutting away the plaſtering ſhould be begun; which may be done with the corner and end of a ſhort ſaw; ſawing between the brick-work and plaſtering, and leaving the thickneſs, or part of the thickneſs, of the plaſtering on the painting faſtened to the bearer. When this edge of the picture is freed, the whole height, for nine or ten inches under the edge of the bearer that is fartheſt from the wall, muſt then be gently forced nearer; conſequently the other edge, together with the painting and plaſter that is freed, will leave the wall, and give an opportunity of introducing the ſaw behind, and cutting away the ſame to a certain diſtance farther under; and, by repeating this, the whole of the picture will at length be freed, and left on the bearer. Each time the bearer is removed, and, as it were, rolled on the vertical ſurface of the wall, care muſt be taken to turn and nail the ſecuring canvas on the top and bottom edges of the bearer, ſo as to ſecure the freed plaſtering and picture from moving about; and, laſtly, before the bearer and plaſtering be moved, to nail the other edge of the picture in the ſame way, which will ſecure the whole to the bearer. This done, the picture and bearer are at liberty to be moved to a proper place, in order to be freed from the remaining plaſter. The edges may then be unnailed; the painting and canvas ſlipped from this bearer on to a plain board; and the new canvas may be then put on; which is to remain till dry, as in other caſes.

“ It may appear, that the bending of the canvas and plaſtering to the convex bearer will crack the plaſter, and damage the painting; but, from experience (ſays Mr Salmon) I have obſerved, that, to a curve of ſuch or even leſs radius, plaſtering will bend, without any viſible crack, even on the exterior part thereof; and that part next the bearer, not having occaſion, in bending, to extend its parts, will conſequently be much leſs liable to be diſturbed by ſuch bending.”

In clearing the wood from the paintings, our author never made uſe of aquafortis, or any other liquid; the uſe of which he conceives would be very tedious, and attended with danger, leſt it ſhould get through the paint, and wet or damp the paſte by which the ſecuring canvas is fixed. In working off the wood, he generally made uſe of ſuch planes as by the joiners are called the *levelled rabbit-plane*, and *ſmall rounds*. By the corners of the former, and proper handling of the latter, the wood is cleared off without force or violence: even the ſmalleſt particles may, in general, be got off; although in ſome paintings, and in particular parts of others, he has met with places on which he thought it beſt to leave ſome particles, or fine ſplinters, of wood, but nothing more. Raſps, and ſometimes a fine chiſel, are uſeful, to clear off ſuch parts as may be in hollow places, or where particles of wood are left, as above. The time required will be various, according to the manner in which the painting was originally done; ſome being painted on boards previouſly prepared with a water colour; others immediately painted with oil on the wood. This laſt ſort is by much the moſt difficult; the other is more eaſy, as the previous preparation prevents the wood from imbibing the oil, and conſequently admits it to be more eaſily ſeparated.

PAJARO, *Pajaros*, or *Paxaros*, iſlands on the coaſt of Chili, on the South Pacific Ocean. Theſe are 3 or 4 rocks, the largeſt of which is called Pajaro Ninno, or Paxaro Ninno, and 2 miles N. W. by N. from the ſouthernmoſt point of the Main, or Point Tortugas, that cloſes the port of Coquimbo.—*Morſe*.

PAJAROS, LES, or *Iſlands of Birds*, a cluſter of ſmall iſlands on the coaſt of Chili, 8 leagues N. N. W. of the Bay of Coquimbo, and 7 S. S. E. of the harbour of Guaſco. The iſland of Choros is 4 miles north of theſe iſlands, towards the harbour of Guaſco.—*ib.*

PAKANOKIT, the ſeat of *Maſaſſoit*, the famous Indian chief, was ſituated on Namaſket river, which empties into Narraganſet Bay.—*ib.*

PALATINE, or *Palentine*, a townſhip in Montgomery county, New York, on the north ſide of Mohawk river, and weſt of Caghnawaga. In 1790, it contained 3,404 inhabitants, including 192 ſlaves. In 1796, 585 of the inhabitants were electors. The compact part of it ſtands on the bank of the Mohawk, and contains a Reformed Dutch church, and 20 or 30 houſes. It is 36 miles above Shenectady.—*ib.*

PALATINE *Town*, in the ſtate of New York, lies on the eaſt bank of Hudſon's river, and north ſide of the mouth of Livingſton river, which empties into the former; 11 miles north of Rhynbeck, and 15 ſoutherly of Hudſon city.—*ib.*

PALILICUM, the ſame as Aldebaran, a fixed ſtar of the firſt magnitude, in the eye of the bull, or ſign Taurus.

PALLIFICATION, or PILING, in architecture, denotes the piling of the ground-work, or the ſtrengthening it with piles, or timber driven into the ground; which is practiſed when buildings are erected upon a moiſt or marſhy ſoil.

PALLISER's *Iſlands*, in the South Pacific Ocean, are between 15 and 16 degrees of S. lat. and from 146 to 147 degrees of W. long. From lat. 14 to 20 S. and long. 138 to 150 W. the ocean is ſtrewed with low, half-overflowed iſlands, which renders it neceſſary for navigators to proceed with much caution.—*Morſe*.

PALM, an ancient long meaſure, taken from the extent of the hand. See PALMUS, *Encycl.*

PALMA, a town of Terra Firma, in N. America, 50 miles N. W. of St Fe de Bagota. N. lat. 4 30, W. long. 73 40.—*Morſe.*

PALMÆ, palms. See *Encyclopædia.* The ſubject is introduced here to notice a kind of palm, the product of North America, of which we have the following account by Dr Barton.

"There grows upon the river Mobile a ſpecies of palm, which is but little known to naturaliſts, but which promiſes to be an important article of food to man. It has no ſtalk or ſtem above ground. The leaves ſpread regularly all round, and when fully expanded are flabelliform. In the centre of theſe leaves is produced the receptacle of the fruit, which is of the form and ſize of a common ſugar-loaf. This receptacle conſiſts of a vaſt number of drupes, or berries, of the ſize and ſhape of common plums: each is covered with a fibrous, farinaceous, pulpy coating, of conſiderable thickneſs. This ſubſtance is ſaid to reſemble manna in texture, colour, and taſte; or, perhaps, it ſtill more reſembles moiſt brown ſugar, with particles of loaf ſugar mixed with it. It is a moſt delicious and nouriſhing food, and is diligently ſought after in the places where it grows. Upon firſt taſting it, it is ſomewhat bitter and pungent."

PALMAS, a large river on the weſt coaſt of the Gulf of Mexico, whoſe mouth is in lat. 25 N. and long. 98 36 W. Some of its branches run in a courſe almoſt directly eaſt from the mountains to the eaſtward of the Gulf of California.—*Morſe.*

PALMER, a rough and hilly townſhip in Hampſhire county, Maſſachuſetts, 82 miles W. by S. of Boſton. It is ſituated on the ſouth ſide of Chickopee river, and bounded eaſtward by Weſtern, in Worceſter county. An act paſſed in laſt ſeſſion, 1796, to incorporate a ſociety to make a turnpike-road between theſe two towns. It was incorporated in 1752, and contains 809 inhabitants.—*ib.*

PALMER's *River*, a water of Narraganſet Bay, which empties with another ſmall river, and forms Warren river, oppoſite the town of Warren.—*ib.*

PALMERSTON's *Iſland*, of which one in particular has been ſo named, is in lat. 18 S. and long. 162 57 W. and is the ſecond in ſituation from the S. E. of a group of 9 or 10, all known by the ſame general name. It affords neither anchorage nor water; but if the weather is moderate, a ſhip that is paſſing the S. Pacific Ocean in this track, may be ſupplied with graſs for cattle, cocoa-nuts, fiſh, and other productions of the iſland. The principal iſland is not above a mile in circumference; nor is it elevated more than 3 feet above the ſurface of the ſea.—*ib.*

PALMETTO, the moſt eaſterly point of the bay ſo called, on the ſouth-weſt coaſt of the iſland of St Chriſtopher's, in the Weſt Indies. The ſhore is rocky, and a fort protects the bay.—Alſo the moſt northerly point of the iſland of Jamaica, having Manatee Bay on the weſt, and Iſland Bay on the eaſt.—*ib.*

PALMISTE *Point*, on the north ſide of the N. W. part of the iſland of St Domingo; three leagues ſouth of Point Portugal, the eaſt point of the ſmall iſland La Tortue, and 5 eaſt of Port de Paix.—*ib.*

PALMYRA, a town, and the only port of entry and delivery, in the ſtate of Teneſſee, conſtituted a port of entry by law of the United States, January 31, 1797.—*ib.*

PALOMINOS, ſmall iſlands on the coaſt of Peru, South America; 3 miles weſt of St Lawrence Iſland, or St Lorenzo. They have from 13 to 18 fathoms water round them.—*ib.*

PALONQUE, the cape eaſt of Niſao Point, at the mouth of Niſao river, on the ſouth ſide of the iſland of St Domingo, in lat. 18 13 N. and long. 73 2 W. of Paris.—*ib.*

PALTZ, *New*, a townſhip on the W. ſide of Hudſon's river, in Ulſter county, New York, about 20 miles N. W. of Newburgh, and 32 north of Goſhen. It contains 2,309 inhabitants, including 302 ſlaves.—*ib.*

PAMBAMACCA, a lofty mountain in the province of Quito, being one of the pikes of the eaſtern Cordilleras.—*ib.*

PAMLICO *Sound*, on the eaſt coaſt of N. Carolina, is a kind of lake or inland ſea, from 10 to 20 miles broad, and nearly 100 miles in length. It is ſeparated from the Atlantic Ocean, in its whole length, by a beach of ſand hardly a mile wide, generally covered with ſmall trees or buſhes. Through this bank are ſeveral ſmall inlets, by which boats may paſs; but Ocrecock Inlet is the only one that will admit veſſels of burden into the diſtricts of Edenton and Newbern. This inlet is in lat. 35 10 N. and opens between Ocrecock Iſland and Core Bank. This ſound communicates with Core and Albemarle Sounds; and receives Pamlico or Tar river, the river Neus, beſides other ſmall ſtreams.—*ib.*

PAMPELUNA, a town of New Granada, in S. America. In its vicinity are gold mines. N. lat. 6 30, W. long. 71 30. It is 150 miles from Santa Fe, and 200 from Maricaibo.—*ib.*

PAMUNKY, the ancient name of York river, in Virginia; but this name is now confined to the ſouthern branch, formed by the confluence of the North and South Anna. This and the northern branch, Mattapony, unite and form York river, juſt below the town of De La War.—*ib.*

PANA, an iſland on the coaſt of Peru, 7 leagues E. N. E. of Santa Clara, and as far from Guayaquil. At Point Arena, which is the weſternmoſt point, all ſhips bound farther into Guayaquil Bay ſtop for pilots, as there is good anchorage over againſt the middle of the town in 5 fathoms, and a ſoft oozy ground. It is alſo called *Puna.*—*ib.*

PANACA, a burning mountain on the W. coaſt of New Mexico, about 3 leagues from the volcano of Sanſonate.—*ib.*

PANADOU, or *Menadou*, a bay on the coaſt of Cape Breton Iſland, near the S. part of the Gulf of St Lawrence.—*ib.*

PANAMA is the capital of Terra Firma Proper, S. America; ſituated on a capacious bay of its name, on the ſouth ſide of the Iſthmus of Panama, or Darien, oppoſite to Porto Bello, on the N. ſide of the iſthmus. It is the great receptacle of the vaſt quantities of gold and ſilver, with other rich merchandize from all parts of Peru and Chili. Here they are lodged in ſtorehouſes, till the proper ſeaſon arrives to tranſport them to Europe. The harbour of Panama is formed in its road by the ſhelter of ſeveral iſlands, where ſhips lie very ſafe, at about 2½ or 3 leagues diſtant from the city. The tides are regular, and it is high water at the full and change at 3 o'clock. The water riſes and falls conſiderably; ſo that the ſhore, lying on a gentle ſlope, is at low water left dry to a great diſtance. Pearls are found here in ſuch plenty, that there are few perſons of property near Panama, who do not employ all, or at leaſt part of their ſlaves, in this fiſhery. The Negroes who fiſh for pearls muſt be both expert ſwimmers, and capable of holding their breath a long time, the work being performed at the bottom of the ſea. This city is a biſhop's ſee, whoſe biſhop is the primate of Terra Firma. It was built by the Spaniards, who, in 1521, conſtituted it a city, with the uſual privileges. In 1670 it was taken, ſacked and burnt by John Morgan, an Engliſh adventurer. The new town was built in a more convenient ſituation, about a league and a half from the former. In 1737, this new town was almoſt entirely deſtroyed by an accidental fire. It is ſurrounded with a ſtone wall and other fortifications, and the public buildings are very handſome. N. lat. 8 57 48, W. long. 82 5 14.—*ib.*

Panama, a province of Terra Firma, of which the city above-mentioned is the capital. This province is called by moſt writers *Terra Firma Proper.* It contains 3 cities, 12 villages, and a great number of *rancheries* or aſſemblages of Indian huts; theſe are ſituated in ſmall plains along the ſhore, the reſt of the country being covered with enormous and craggy barren and uninhabited mountains. It has ſeveral gold mines; but the pearl fiſhery affords a more certain profit, and at the ſame time is acquired with much greater eaſe.—*Ib.*

PANAMARIBO, on the coaſt of Surinam, in Guiana, in S. America, is E. S. E. of Demarara, in lat. about 6 N. and long. 56 26 W.—*ib.*

PANECILLO, an eminence near Quito, which ſupplies that city with excellent water.—*ib.*

PANIS. There are two Indian nations ſo named. The White Panis inhabit S. E. of the Miſſouri, and can furniſh 1500 wariors; and the Speckled Panis S. of the Miſſouri, 1200 warriors.—*ib.*

PANORAMA, a word derived from παν and οραμα; and therefore employed of late to denote a painting, whether in oil or water colours, which repreſents an entire view of any country, city, or other natural objects, as they appear to a perſon ſtanding in any ſituation, and turning quite round. To produce this effect, the painter or drawer muſt fix his ſtation, and delineate correctly and connectedly every object which preſents itſelf to his view as he turns round, concluding his drawing by a connection with where he began. He muſt obſerve the lights and ſhadows, how they fall, and perfect his piece to the beſt of his abilities. There muſt be a circular building or framing erected, on which this drawing or painting may be performed; or the ſame may be done on canvas, or other materials, and fixed or ſuſpended on the ſame building or framing, to anſwer the purpoſe complete. It muſt be lighted entirely from the top, either by a glazed dome, or otherwiſe as the artiſt may think proper. There muſt be an incloſure within the ſaid circular building or framing, which ſhall prevent an obſerver going too near the drawing or painting, ſo as it may, from all parts it can be viewed, have its proper effect. This incloſure may repreſent a room, or platform, or any other ſituation, and may be of any form thought moſt convenient; but the circular form is particularly recommended. Of whatever extent this inſide incloſure may be, there muſt be over it (ſupported from the bottom, or ſuſpended from the top) a ſhade or roof; which, in all directions, ſhould project ſo far beyond this incloſure, as to prevent an obſerver from ſeeing above the drawing or painting when looking up; and there muſt be without this incloſure another interception, to repreſent a wall, paling, or other interception, as the natural objects repreſented, or fancy, may direct, ſo as effectually to prevent the obſerver from ſeeing below the bottom of the drawing or painting; by means of which interception, nothing can be seen on the outer circle but the drawing or painting intended to repreſent nature. The entrance to the inner incloſure muſt be from below, a proper building or framing being erected for that purpoſe, ſo that no door or other interruption may diſturb the circle on which the view is to be repreſented. And there ſhould be, below the painting or drawing, proper ventilators fixed, ſo as to render a current circulation of air through the whole; and the inner incloſure may be elevated, at the will of an artiſt, ſo as to make obſervers, on whatever ſituation he may wiſh they ſhould imagine themſelves, feel as if really on the very ſpot.

PANSE, De La, a branch of Wabaſh river, in the N. W. Territory.—*Morse.*

PANTON, a townſhip in Addiſon county, Vermont, ſituated on the E. ſide of Lake Champlain, between Addiſon and Ferriſburg, and about 87 miles N. of Bennington. It contains 220 inhabitants.—*ib.*

PANUCO, or *Guaſtica*, a province of N. America, in New Spain, bounded E. by the Gulf of Mexico, and W. by the provinces of Mechoacan and New Biſcay. The tropic of Cancer divides this province. It is about 55 leagues each way. The part neareſt to Mexico is much the beſt and richeſt, abounding with proviſions, and having ſome veins of gold, and mines of ſalt. Other parts are wretchedly poor and barren. —*ib.*

Panuco, the capital of the above-mentioned province; it is the ſee of a biſhop, and ſtands upon a river of its own name, 17 leagues from its mouth, on the W. ſhore of the Gulf of Mexico, and 60 N. W. of the city of Mexico. The river is navigable for large ſhips a great way above the city; but the harbour has ſo large a bar before it, that no ſhips of burden can enter it. N. lat. 23 50. W. long. 99 50.—*ib.*

PAPAGAYO, a gulf on the N. Pacific ocean, and on the W. ſide of the Iſthmus of Nicaragua, a ſmall diſtance from the weſtern parts of the lake of Nicaragua, and in lat. about 11 15 N.—*ib.*

PAPALOAPAIN, the largeſt river of Guaxaca, in New Spain, called alſo Alvarada. It riſes in the mountains Zoncoliucan, and, being enlarged by the acceſſion of leſſer rivers, falls into the North Pacific Ocean.—*ib.*

PAPER is an article of ſuch importance, and at preſent* of ſo enormous a price, that no improvement in its manufacture ſhould paſs unnoticed in a work of this nature. The diſcovery made in France by M. Bertholet of the efficacy of oxy-muriatic acid in expediting the proceſs of Bleaching (ſee that article in this *Suppl.*), has contributed eſſentially to facilitate the manufactures, not only of cotton and linen cloths, but alſo of paper, of which it has even increaſed the materials. Formerly writing paper could be made of *unprinted* linen alone; but by means of the proceſs of M.

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* 1801.

Bertholet even printed linen may be made into the fineſt and whiteſt paper. In the year 1795, a patent was granted to Mr Elias Carpenter, of Bermondſay, Surrey, for a method of bleaching paper of ſuch materials in the *water-leaf* or *ſheet*, and ſizing it without drying.

In the preparation of the pulp, the coarſer rags are to be macerated for two or three days in a cauſtic alkaline ley, and wrought into ſheets of paper in the uſual way; a ſtrong wooden box or trough is then to be procured, of a ſize proportioned to that of the paper, lined on the inſide with white paint, and furniſhed with ſeveral ſtages of croſs bars of glaſs; the bottom of the box is to be covered with a ſtratum about one inch deep of cauſtic ley, and the paper laid by quarter reams, or leſs, acroſs the glaſs bar. A hole muſt be made in the box to admit the beak of an earthen-ware retort, into which muſt be put manganeſe and ſea ſalt, in powder, ſulphuric acid, and an equal quantity of water impregnated with the ſteams of burning ſulphur (ſulphureous acid). The cover of the box is to be made air-tight by luting or ſlips of paper dipped in paſte. The apparatus being thus prepared, the belly of the retort is to be plunged in water, kept boiling, and in a ſhort time the oxy-muriatic gas will be driven into the box, will penetrate the paper, and render it of a dazzling whiteneſs, while the alkaline ley at the bottom will, by gradually abſorbing it, prevent its becoming ſo concentrated as to deſtroy or injure the texture of the paper. From three to four pounds of ſulphuric acid will ſuffice for one hundred weight of paper, and the operation will be completed in about eight hours. The ſheets as they are taken out of the box are to be ſized with the following mixture:

To 1 cwt. of clippings of ſkin add 14 lb. of alum, 7 of calcined vitriol, and 1 lb. of gum arabic, with a ſufficient quantity of water to ſize 50 reams of fools-cap.

The ſame method will ſerve equally well to clean engravings or printing; for though the oxy-muriatic acid diſcharges all ſtains, dirt, &c. yet it is incapable of acting on printers ink.

This, however, is not the only improvement in the manufacture of paper derived from modern chemiſtry. In Crell's *Chemical Annals* for the year 1797, we have an account of ſome curious experiments made by M. L. Brugnatelli, with the view of rendering

Paper incombuſtible, and the writing on it, of courſe, indeſtructible by fire. Of all the ſubſtances which he tried, he found the liquor of flints the moſt proper to ſecure paper from deſtruction by fire. He dipped a ſheet of paper ſeveral times in the above liquor freſh made, or daubed it ſeveral times over the whole paper with a hair bruſh, and dried it in the ſun or in an oven. Paper prepared in this manner loſt ſome of its ſoftneſs, became a little rougher than before, and acquired a lixivious cauſtic taſte. In other reſpects it was not different from common white paper. When this paper was laid upon glowing coals, it did not burn like common paper, but became red, and was converted to a coal, which however did not fall into aſhes like the coal of common paper, ſo that it might therefore be conſidered as petrified paper. This coal, however, is exceedingly friable; for when it is taken between the fingers, or preſſed together in any manner whatever, it drops to pieces. Still the diſcovery muſt be a valuable one, if there be any kind of ink of ſuch a nature as that the characters written with it continue viſible on this coal. Such an ink M. Brugnatelli made by combining diſſolved nitre of zinc with common ink; and found, that the colour of this mixture, though it appeared ſomewhat pale on common paper, became ſo dark on prepared paper, that words written with it appeared more conſpicuous than words written with common ink. When the paper was burnt, or reduced to a coal, thoſe characters were ſo viſible, in a clear *white* colour on a *dark* ground, that they could be read with as much eaſe as characters written with the beſt ink on white paper. If the ingenious author ſucceed in his attempts to diſcover a method of rendering his prepared paper leſs friable when burnt, his diſcovery will be one of the moſt important of the preſent age.

PAPINACHOIS, a bay on the north ſhore of the river St Lawrence, in N. America, 5 leagues ſouth-weſt of St Margaret's river. An Indian nation of the ſame name inhabit the country ſouth of Piretibbe Lake in Lower Canada.—*Morſe.*

PAPPA FORD, on Peleſon or Clinch river, lies 12 miles from Emery's river, and 10 from Campbell's Station, near Holſton.—*ib.*

PAPUDA, on the coaſt of Chili, and on the S. Pacific Ocean, 5 leagues north of the ſhoals of Quintero, and 4 from Port Liga. The water is very deep in Papuda, but the anchorage is good, and the entrance ſafe.—*ib.*

PARA, the moſt northern of 5 colonies or governments, Para, Maragnon, Matto-Groſſo, Goyas, and St Paul, in S. America, at which places the Indians have been united in 117 villages, over which a white man preſides with deſpotic ſway. The government of Para comprehends that portion of Guiana which belongs to the Portugueſe, the moſt barren and unwholſome country in all theſe regions.—*ib.*

Para *Iſland* is one of the range of iſlands to the ſouth-eaſt of Sypomba, to the eaſtward of the great river Amazon, which is the north-weſt limit of the Brazil coaſt in S. America. Theſe iſlands form the great river or bay of Para. About 9 leagues eaſt by ſouth of this iſland is Cape Cuma, the weſtern boundary of the great gulf of Maranhao. On the iſland is a fort belonging to the Portugueſe. There is alſo a ſmall river of the ſame name, at the mouth of which is good riding for large ſhips, becauſe the iſland breaks off the ſea, and two high points ſecure it from the north and eaſt winds.—*ib.*

Para *River* or *Bay*, near the N. W. part of the coaſt of Brazil, in S. America, has a town of its name at the mouth of it, with a large fort and a platform of cannon at the water's edge, commanding the road. Above this is the caſtle ſeated on a high rock, ſurrounded by a ſtrong ſtone wall that is alſo mounted with cannon. The road, within the mouth of the river, is good, having clean ground, and ſecured by high land on both ſides. The mouth of the river is about 6 miles broad at the town; and ſhips may ride in 15 fathoms, within a cable's length of the ſhore, and in 10 fathoms cloſe under the fort. This harbour is much frequented for all kinds of proviſions which abound here. Tobacco is carried from this to Pernambuco, to be ſhipped for Europe. The river is about 200 miles long.—*ib.*

PARABOLIC Conoid is a ſolid generated by the rotation of a parabola about its axis. This ſolid is equal to half its circumſcribed cylinder; and therefore if the baſe be multiplied by the height, half the product will be the ſolid content.

Parabolic Pyramidoid, is a ſolid figure, thus named by Dr Wallis from its geneſis or formation, which is thus: Let all the ſquares of the ordinates of a parabola be conceived to be ſo placed, that the axis ſhall paſs perpendicularly through all their centres; then the aggregate of all theſe planes will form the parabolic pyramidoid. This figure is equal to half its circumſcribed parallelopipedon. And therefore the ſolid content is found by multiplying the baſe by the altitude, and taking half the product; or the one of theſe by half the other.

Parabolic Space, is the ſpace or area included by the curve line and baſe or double ordinate of the parabola.

Parabolic Spindle, is a ſolid figure conceived to be formed by the rotation of a parabola about its baſe or double ordinate.

Parabolic Spiral, is a curve ariſing from the ſuppoſition that the common or Apollonian parabola is bent or twiſted till the axis come into the periphery of a circle, the ordinates ſtill retaining their places and perpendicular poſitions with reſpect to the circle, all theſe lines ſtill remaining in the ſame place. This figure is ſometimes called the *Helicoid parabola*.

PARABOLOIDES, parabolas of the higher orders. The equation for all curves of this kind being $a^{m-n} x^{n} = y^{m}$, the proportion of the area of any one to the complement of it to the circumſcribing parallelogram, will be as *m* to *n*.

PARACENTRIC Motion, denotes the ſpace by which a revolving planet approaches nearer to, or recedes farther from, the ſun, or centre of attraction.

Paracentric Solicitation of Gravity, is the ſame as the vis centripeta.

PARACA, a bay on the coaſt of Peru, 40 leagues S. E. by S. of the port of Callao. Ships receive ſhelter here, when driven out of the harbour of Cangallan or Sangallan, which is 3 leagues S. E. of Carette Iſland, and N. N. W. of the iſland of Lobos.—*Morse*.

PARACHUTE, a kind of large and ſtrong umbrella, contrived to break a perſon's fall from an air-balloon, ſhould any accident happen to the balloon at a high elevation. This contrivance was firſt thought of by Blanchard, who, at different times, by means of the parachute, let fall from his balloon dogs and other animals. He ventured even to deſcend in this manner himſelf; but, whether from the bad conſtruction of his parachute, or from falling among trees, he had the miſfortune to break one of his legs. Citizen Garnerin, as he chooſes to be called, was more ſucceſsful. On the 21ſt of October, 1797, he aſcended from the garden de Mauſſeux at half paſt five in the evening; between the balloon and the car, in which he ſat, was placed the parachute, half opened, and forming a kind of tent over the aërial traveller; and when the whole apparatus was at a conſiderable height, he ſeparated the parachute and car from the balloon. The parachute unfolding itſelf, was, by his weight and that of the car, drawn of courſe towards the earth. Its fall was at firſt ſlow and vertical; but ſoon afterwards it exhibited a kind of balancing or vibration, and a rotation gradually increaſing, which might be compared with that of a leaf falling from a tree. The aëronaut, however, reached the ground unhurt.

This parachute was of cloth, and its diameter, when unfolded, about twenty-five feet. To uſe ſuch inſtruments with ſucceſs, it is neceſſary that the car be ſuſpended at a conſiderable diſtance from the parachute, ſo as that the centre of gravity of the whole ſhall be vertically below the centre of reſiſtance made by the air to the deſcent of the parachute; for if the car be otherwiſe placed, it is evident that the parachute will incline to one ſide, deſcend obliquely, oſcillate, and the ſmalleſt irregularity in its figure will cauſe it to turn round its vertical axis.

PARADISE, a townſhip of Pennſylvania, in York county.—*Morse*.

PARAGUATAN, a kind of wood which grows in Guiana, and promiſes to be of great utility as a dye ſtuff. We have ſeen no botanical deſcription of the tree; but from the report made to the council of trade and mines, by D. Dominique Garcia Fernandez, inſpector of coinage, we learn that its bark, boiled in water, affords a coloured extract which reſiſts the agency of acids for a longer time than brazil or logwood; that the colour may be revived by means of alkalies, after it has been deſtroyed by combination with acids; that vinegar, lemon-juice and tartar, render this colour more brilliant, while they entirely deſtroy the colours of brazil and logwood; that the fecula of the bark of paraguatan fixes and attaches itſelf to wool, cotton, and ſilk; and that the colour is brighter on ſilk than on wool, and brighter on wool than on cotton. The ſame fecula dried is afterwards ſoluble in alcohol, to which it communicates a tinge ſimilar to that afforded by cochineal; but it muſt be confeſſed, that the colour obtained from paraguatan has not the force of that of cochineal, though it is ſuperior to thoſe of madder, brazil wood, and logwood. From theſe facts D. Fernandez conſiders the paraguatan as one of the moſt valuable productions which America furniſhes to Spain.

PARAGUAY, a large river of S. America, which falls into the river La Plata that forms the ſouthern boundary of Brazil. At the diſtance of 100 leagues from the ſea, where this and Parana river fall into the channel, it is at leaſt 10 leagues over.—*Morse*.

PARAIBA, or *Parayba*, the moſt northern province of Brazil, in S. America, lying between Rio Grande to the north, and the river Tamarack to the ſouth, the South Atlantic Ocean to the eaſt, and Figuares to the weſt. It belongs to the Portugueſe, and abounds in ſugar-canes, Brazil-wood, cattle, tobacco, cotton, &c. This diſtrict was given by John III. of Portugal, to the hiſtorian De Barros, but he neglected the peopling of it. Some vagabonds went over in 1560, and in 1591 were ſubdued by the French, who were ſoon obliged to evacuate it. Philip III. cauſed a city to be built upon this royal domain, which is at preſent known by the name of *Notre Dame de Neves*.—*ib*.

Paraiba, the metropolis of the above province, or captainſhip, ſituated on the ſouth bank of a river of its name, three leagues from the ſea; according to others, 10 leagues; the river being navigable for ſhips loaded with 600 or 700 hhds. of ſugar, a conſiderable diſtance above the city. The Dutch captured it in 1635; but the Portugueſe retook it ſoon after. It has many ſtately houſes decorated with marble pillars, together with large warehouſes and magazines belonging to the merchants. The mouth of the river is well fortified. S. lat. 6 50, W. long. 49 53.—*ib.*

PARALLAX (ſee *Encycl.*) is uſed, not only in aſtronomy, but alſo in levelling, for the angle contained between the line of true level and that of apparent level. And, in other branches of ſcience, for the difference between the true and apparent places.

PARALLEL Ruler, is a mathematical inſtrument, conſiſting of two equal rulers, either of wood or metal, connected together by two ſlender croſs bars or blades of equal length, moveable about the points of junction with the rulers. There are other forms of the inſtrument; ſome, for inſtance, having the two blades croſſing in the middle, and fixed only at one end of them, the other two ends ſliding in grooves along the two rulers, &c.

The uſe of this inſtrument is obvious. For the edge of one of the rulers being applied to any line, the other opened to any extent will be always parallel to the former; and conſequently any parallels to this may be drawn by the edge of the ruler, opened to any extent.

PARALLELS, or Places of Arms, in a ſiege, are deep trenches, 15 or 18 feet wide, joining the ſeveral attacks together; and ſerving to place the guard of the trenches in, to be at hand to ſupport the workmen when attacked. There are uſually three in an attack: the firſt is about 600 yards from the covert-way, the ſecond between 3 and 400, and the third near or on the glacis. It is ſaid they were firſt invented or uſed by Vauban.

PARALLELISM of the Earth's Axis, is that invariable ſituation of the axis, in the progreſs of the earth thro' the annual orbit, by which it always keeps parallel to itſelf; ſo that if a line be drawn parallel to its axis, while in any one poſition, the axis, in all other poſitions or parts of the orbit, will always be parallel to the ſame line.

PARAMETER, a certain conſtant right line in each of the three conic ſections; otherwiſe called alſo *latus rectum.*

PARAMARIBO, the capital of the Dutch ſettlement at Surinam, is ſituated on the right ſide of the beautiful river Surinam, at about 16 or 18 miles diſtance from its mouth. It is built upon a kind of gravelly rock, which is level with the reſt of the country, in the form of an oblong ſquare; its length is about a mile and a half, and its breadth about half as much. All the ſtreets, which are perfectly ſtraight, are lined with orange, ſhaddock, tamarind, and lemon trees, which appear in everlaſting bloom; while, at the ſame time, their branches are weighed down with the richeſt cluſters of odoriferous fruit. Neither ſtone nor brick is made uſe of here for pavement; the whole being one continued gravel, not inferior to the fineſt garden walks in England, and ſtrewed on the ſurface with ſea ſhells. The houſes, which are moſtly of two and ſome of three ſtories high, are all built of fine timber, a very few excepted; moſt of the foundations are of brick, and they are roofed with thin ſplit boards, called *ſhingles*, inſtead of ſlates or tiles. Windows are very ſeldom ſeen in this country, glaſs being inconvenient on account of the heat; inſtead of which they uſe gauze frames: ſome have only the ſhutters, which are kept open from ſix o'clock in the morning until ſix at night. As for chimneys, there are none in the colony; no fires being lighted except in the kitchens, which are always built at ſome diſtance from the dwelling-houſe, where the victuals are dreſſed upon the floor, and the ſmoke let out by a hole made in the roof: theſe timber houſes are, however, very dear in Surinam, one of them having coſt above £15,000 ſterling. There is no ſpring water to be met with in Paramaribo; moſt houſes have wells dug in the rock, which afford but a brackiſh kind of beverage, only uſed for the negroes, cattle, &c. and the Europeans have reſervoirs or ciſterns, in which they preſerve rain-water for their own conſumption; thoſe of nicer taſte let it firſt drop through a filtering ſtone into large jars or earthen pots, made by the native Indians on purpoſe, which they barter at Paramaribo for other commodities. The inhabitants of this country, of every denomination, ſleep in hammocks, the negro ſlaves excepted, who moſtly lie on the ground: the hammocks uſed by thoſe in ſuperior ſtations are made of cotton, ornamented with rich fringe; theſe are alſo made by the Indians, and ſometimes worth above twenty guineas; neither bedding nor covering is neceſſary, except an awning to keep off the muſquitoes. Some people indeed lie on bedſteads; in that caſe they are ſurrounded, inſtead of curtains, with gauze pavilions, which admit the air freely, and at the ſame time keep off the ſmalleſt inſect. The houſes in general at Paramaribo are elegantly furniſhed with paintings, gilding, cryſtal chandeliers, china jars, &c.; the rooms are never papered or plaſtered, but beautifully wainſcotted with cedar, and Brazil, and mahogany wood.

The number of buildings in Paramaribo is computed at about 1400, of which the principal is the governor's palace, whence there is a private paſſage through the garden which communicates with Fort Zelandia. This houſe, and that of the commandant, which has lately been burnt, were the only brick buildings in the colony. The town-hall is an elegant new building, and covered with tiles; here the different courts are held, and underneath are the priſons for European delinquents, the military excepted, who are confined in the citadel of Fort Zelandia. The Proteſtant church, where divine worſhip is performed both in French and Low Dutch, has a ſmall ſpire with a clock; beſides which there is a Lutheran chapel, and two elegant Jewiſh ſynagogues, one German the other Portugueſe. Here is alſo a large hoſpital for the garriſon, and this manſion is never empty. The military ſtores are kept in the fortreſs, where the ſociety ſoldiers are alſo lodged in barracks, with proper apartments for ſome officers. The town of Paramaribo has a noble road for ſhipping, the river before the town being above a mile in breadth, and containing ſometimes above 100 veſſels of burden, moored within piſtol-ſhot of the ſhore. Before Holland became a province of France, and thereby loſt her trade, there were ſeldom fewer than 80 ſhips at Paramaribo, loading coffee, ſugar, cocao, cotton and indigo, for the mother country, including alſo the Guinea-men that bring ſlaves from Africa, and the North American and Leeward Iſland veſſels, which bring flour, beef, pork, ſpirits, herrings, and mackarel ſalted, ſpermaceti candles, horſes, and lumber; for which they receive chiefly molaſſes to be diſtilled into rum. This town is not fortified, but is bounded by the river on the ſouth-eaſt; by a large ſavannah on the weſt; by an impenetrable wood on the north eaſt; and is protected by Fort Zelandia on the eaſt. This citadel is only ſeparated from the town by a large eſplanade, where the troops parade occaſionally. The fort is a regular pentagon, with one gate fronting Paramaribo, and two baſtions which command the river; it is very ſmall but ſtrong, being made of rock or hewn ſtone, ſurrounded by a broad foſſe well ſupplied with water, beſides ſome outworks. On the eaſt ſide, fronting the river, is a battery of 21 pieces of cannon. On one of the baſtions is a bell, which is ſtruck with a hammer by the centinel, who is directed by an hour-glaſs. On the other is planted a large enſign-ſtaff, upon which a flag is hoiſted upon the approach of ſhips of war, or on public rejoicing days. The walls are ſix feet thick, with embraſures, but no parapet.

Paramaribo is a very lively place, the ſtreets being generally crowded with planters, ſailors, ſoldiers, Jews, Indians, and Negroes, while the river is covered with canoes, barges, &c. conſtantly paſſing and repaſſing like the wherries on the Thames, often accompanied with bands of muſic; the ſhipping alſo in the road adorned with their different flags, guns firing, &c. not to mention the many groupes of boys and girls playing in the water, altogether form a pleaſing appearance; and ſuch gaiety and variety of objects ſerve, in ſome meaſure, to compenſate for the many inconveniencies of the climate. Their carriages and dreſs are truly magnificent; ſilk embroidery, Genoa velvets, diamonds, gold and ſilver lace, being daily worn, and even the maſters of trading ſhips appear with buttons and buckles of ſolid gold. They are equally expenſive at their tables, where every thing that can be called delicate is produced at any price, and ſerved up in plate and china of the neweſt faſhion, and moſt exquiſite workmanſhip. But nothing diſplays the luxury of the inhabitants of Surinam more than the number of ſlaves by whom they are attended, often twenty or thirty in one family. White ſervants are ſeldom to be met with in this colony.

The current money are ſtamped cards of different value, from five ſhillings to fifty pounds: gold and ſilver is ſo ſcarce, that the exchange premium for ſpecie is often above 10 *per cent*. A baſe Dantzic coin called a *bit*, value ſomething leſs than ſixpence, is alſo current in Surinam. Engliſh and Portugueſe coin are ſometimes met with, but moſtly uſed as ornaments by the Mulatto, Samboe, Quaderoon, and Negro girls. The Negro ſlaves never receive any paper money; for as they cannot read, they do not underſtand its value; beſides, in their hands it would be liable to many accidents, from fire or children, and particularly from the rats, when it becomes a little greaſy.

This town is well ſupplied with proviſions, *viz.* butchers meat, fowls, fiſh, and veniſon. Vegetables in particular the country abounds with; beſides the luxuries peculiar to this climate, they import whatever Europe, Africa, and Aſia can afford. Proviſions, however, are exceſſively dear in general, eſpecially thoſe imported, which are moſtly ſold by the Jews and maſters of ſhips. The firſt enjoy extraordinary privileges in this colony; the latter erect temporary warehouſes for the purpoſe of trade, during the time their ſhips are loading with the productions of the climate. Wheat flour is ſold from four-pence to one ſhilling per pound; butter, two ſhillings; butcher's meat never under one ſhilling, and often at one ſhilling and ſix pence; ducks and fowls from three to four ſhillings a couple. A ſingle turkey has ſometimes coſt one guinea and a half; eggs are ſold at the rate of five, and European potatoes twelve, for ſixpence. Wine three ſhillings a bottle Jamaica rum a crown a gallon. Fiſh and vegetables are cheap, and fruit almoſt for nothing.

PARATEE, a bay on the ſouth-weſt ſide of the iſland of Jamaica. It is ſouth-eaſt of Baniſter Bay, its ſouth-eaſt point is alſo called *Paratee*.—*Morſe.*

PARAYBA, a river on the coaſt of Brazil, 10 leagues N. of Port Francezes. The city lies 8 leagues from its mouth. S. lat. 6 50, W. long. 49 53.—*ib.*

PARDUBA, a bay on the coaſt of Brazil, 10 leagues W. N. W. of Brandihi Bay.—*ib.*

PARHAM *Town* and *Harbour*, on the north ſide of the iſland of Antigua, in the Weſt-Indies. The harbour is defended by Byram Fort, at Barnacle Point, on the weſt ſide, and farther up by another fort on the E. ſide. The town is regularly built, and lies at the head of the harbour, and in St Peter's pariſh.—*ib.*

PARIA, or *New Andaluſia*, a country of S. America, and in Terra Firma, bounded on the north by the north ſea, and ſouth by Guiana. The ſea coaſt is moſtly inhabited, on which there are ſeveral towns.—*ib.*

PARIA, a juriſdiction in the archbiſhoprick of La Plata, in S. America, beginning 70 leagues N. W. of that city, and extending about 40 leagues. It has ſome ſilver mines; and the cheeſe made here is much eſteemed, and ſent all over Peru.—*ib.*

PARIA, *Gulf of*, a ſtrait lying between the N. W. part of New-Andaluſia, and the ſouthern ſhore of the iſland of Trinidad. N. lat. 9 12, W. long. 62 5.—*ib.*

PARINA, a point N. W. of the harbour of Payta, on the coaſt of Peru. The country within the point is high and mountainous. Between Payta and it, is a large bay, having ſhoals. The land is low, and ſome white hills all the way.—*ib.*

PARINA-COCAS, a juriſdiction in the dioceſe of Guamanga, in the audience of Lima, beginning about 20 leagues ſouth of the city of Guamanga, and extending above 25 leagues. It has excellent paſtures, grain, and fruits. The mines of ſilver and gold are more productive than formerly; and theſe form the chief branch of its commerce.—*ib.*

PARIS (Francis), a man more famous after his death than during his life, by the miracles which were ſaid to be performed at his tomb. He is generally known by the name of Abbé Paris; and his pretended miracles, with others of like manufacture, have furniſhed deiſtical writers, and Mr Hume in particular, with a kind of argument againſt the reality of the miracles of which we have an account in the Goſpel. It is merely that we may ſtate his pretenſions fairly, that we have introduced him to the notice of our readers; for in every other reſpect he is wholly unworthy of their regard. He was the ſon of a counſellor in Parliament, and had the proſpect, if he had choſen it, of ſucceeding to his father's appointment; but he choſe rather to become an eccleſiaſtic, and he became a very zealous one. He gave up all his poſſeſſions to his brother, refuſed

fuſed preferment intended for him by the cardinal de Noailles, devoted himſelf entirely to retirement, and made ſtockings for his own ſupport, and for the aſſiſtance of the poor. He died, perhaps in conſequence of his rigorous mode of life, May 1, 1727, at the age of only 37. His brother raiſed a monument to him in the ſmall churchyard of St Medard, to which the poor and the pious ſoon began to flock; and after a time it was reported, that, in conſequence of their prayers at that tomb, ſome ſick perſons had received cures. As Paris had been a rigorous Janſeniſt, this was a fine opportunity for that ſect to gain credit to their cauſe; the miracles were therefore multiplied, and a variety of perſons affected the moſt ſingular convulſions.

The minds of the people becoming inflamed by theſe extravagancies, the court found it neceſſary to ſhut up the churchyard, which was done on the 27th of January 1732. On this occaſion, ſome profane wit wrote upon the wall of the place,

> De par le Roy, defenſe a Dieu,
> De ſaire miracles en ce lieu.

The convulſions were continued, for a little while, in private houſes, but by degrees the matter ſubſided, and the Abbé Paris was forgotten.

The diſtinction between miracles exhibited to ſerve a party, and atteſted only by thoſe who are zealous in its ſupport, and miracles performed in the ſight of unbelievers, who, in ſpite of their deep-rooted prejudices, were converted by them, is too ſtriking to be overlooked by any, but thoſe who are deſirous of drawing a falſe and impious parallel; yet has Mr Hume dared to repreſent the miracles performed at the tomb of this ſaint as outvying in number, nature, and evidence, the miracles of Chriſt and his apoſtles—with what truth, the following obſervations will ſhew:

1ſt, It was often objected by the enemies of the ſaint, and the objection was never confuted by his friends, that the *proſtrations* at his ſepulchre, like animal magnetiſm more lately, *produced* more diſeaſes than they *cured*. Such, ſurely, was not the nature of our Saviour's miracles.

2dly, Though the crowds of ſick and infirm perſons who flocked to the tomb for relief were, by all accounts, innumerable; yet all the cures, of which the zealous hiſtorian of the Miracles could procure vouchers, amounted only to NINE! Now, were thouſands, and ten thouſands of diſeaſed perſons to apply to ſome circumforaneous quack, in full aſſurance of his extraordinary abilities and ſkill in phyſic, could it ſurpriſe any perſon, if the diſtempers of *eight* or *nine* of them ſhould take a favourable turn while they were under a courſe of his uſeleſs medicines?

3dly, We do not read that of thoſe nine who were cured by the dead Abbé, the greater part were Jeſuits and enemies to the Janſeniſts; whereas the greater part of our Saviour's miracles were performed upon unconverted Jews, and one of them upon the ſervant of the high prieſt, who was thirſting for his blood.

4thly, The cures reported to have been performed at the grave of Paris were all ſuch as might have been accompliſhed by natural means. Thus, a Spaniard who had loſt one eye, and was diſtreſſed with an inflammation in the other, haſt the inflamed eye gradually cured, but not the loſt eye reſtored. Another perſon having pricked his eye with an awl, loſt the ſight of it in conſequence of the aqueous humour dropping out; but his ſight was reſtored *whilſt* he was paying his devotions to the Abbé—and ſo it would have been while he was curſing the Abbé, had he continued his execrations for a ſufficient length of time.

5thly, None of the cures ſaid to have been performed were *inſtantaneous*. *All* the worſhippers at the tomb perſiſted for *days*, ſeveral of them for *weeks*, and ſome for *months*, daily imploring the interceſſion of the Abbé *before* they received relief from their complaints.

6thly, Moſt of the devotees had been uſing *medicines* before they applied to the ſaint, and continued to uſe them *during the whole time* of their application; whilſt it is confeſſed that the diſtempers of others had *abated* before they determined to ſolicit his help.

7thly, Some of the cures atteſted were *incomplete*, and only of a temporary duration. Thus, the Spaniard was relieved only from the moſt inconſiderable part of his complaint, and that too but for a very ſhort period; for ſoon after his return home he relapſed into his former malady, as was fully atteſted by certificates and letters from Madrid. All this has been completely proved by the Archbiſhop of Sens; who in his *Paſtoral Inſtruction*, publiſhed at the time the miracles were making a noiſe, has,

8thly, Clearly detected the deceit and little artifices by which thoſe pretended miracles were ſo long ſupported. To that work we refer our readers; requeſting them, after they have read it, to compare the evidence for the miracles of Paris with the evidence which in the article MIRACLE (*Encycl.*) we have ſtated for the reality of the Goſpel miracles, and to judge for themſelves with the impartiality of philoſophers.

Paris wrote a few very indifferent books of annotations on the Epiſtles to the Romans, to the Galatians, and the Hebrews; but few have ever read them, nor would they have reſcued the author from oblivion, without the aid of his lying wonders.

PARIS, a thriving townſhip of excellent land in New-York ſtate, Herkemer county. It is ſouth-weſt of Whiteſtown 6 miles, from which it was taken, and incorporated in 1792. In 1795, 4 townſhips were taken from it, viz. Hamilton, Sherburne, Brookfield, and Sangersfield. It contained, by the ſtate cenſus of 1796, 3,459 inhabitants, of whom 564 were electors. Iron ore is found in the vicinity of Paris. Hamilton academy is ſituated in this town, in Clinton pariſh, where alſo a Congregational church has lately been erected, and marks of rapid progreſs in improvements and wealth are viſible.—*Morſe.*

PARKER's *Iſland*, in Lincoln county, Diſtrict of Maine, is formed by the waters of Kennebeck river on the weſt, by the ſea on the ſouth, by Jeremyſquam Bay on the eaſt, and by a ſmall ſtrait, which divides it from Arrowſick Iſland, on the north. It derives its name from John Parker, who purchaſed it of the natives in 1650; and a part of it ſtill remains to his poſterity. It is in the townſhip of *Georgetown*.—*ib.*

PARKER's *River* takes its riſe in Rowley, in Eſſex county, Maſſachuſetts, and, after a courſe of a few miles paſſes into the ſound which ſeparates Plumb-Iſland from the main land. It is navigable about two miles from its mouth, where a bridge croſſes it 870 feet long and 26 feet wide, conſiſting of ſolid piers and 8 wooden arches. It is on the poſt-road from Boſton eaſtward, and was built in 1758. It is ſupported by a toll.—*ib.*

PARKHURST (the Rev. John), was the ſecond ſon of John Parkhurſt, Eſq; of Cateſby in Northamptonſhire. His mother was Ricarda Dormer, daughter of Judge Dormer. He was born in June 1728, was educated at the ſchool of Rugby in Warwickſhire, and was afterwards of Clare-hall, Cambridge; B. A. 1748, M. A. 1752; and many years fellow of his college.

Being a younger brother, he was intended for the church; but not long after his entering into holy orders his elder brother died. This event made him the heir of a very conſiderable eſtate; though, as his father was ſtill living, it was ſome time before he came into the full poſſeſſion of it; and when he did come into the poſſeſſion of it, the acquiſition of fortune produced no change on his manners or his purſuits. He continued to cultivate the ſtudies becoming a clergyman; and from his family connections, as well as from his learning and piety, he certainly had a good right to look forward to preferment in his profeſſion; but betaking himſelf to retirement, and to a life of cloſe and intenſe ſtudy, he ſought for no preferment; and, according to the author of the biographical ſketch of him publiſhed in the Gentleman's Magazine, he lived not in an age when merit was urged forward. Yet, in the capacity of a curate, but without any ſalary, he long did the duty, with exemplary diligence and zeal, in his own chapel at Cateſby, which, after the demolition of the church of the nunnery there, ſerved as a pariſh church, of which alſo he was the patron.

When, ſeveral years after, it fell to his lot to exerciſe the right of preſentation, he was ſo unfaſhionable as to conſider church patronage as a truſt rather than a property; and, accordingly, reſiſting the influence of intereſt, favour, and affection, preſented to the vicarage of Epſom, in Surrey, the Rev. Jonathan Boucher, who ſtill holds it. This gentleman was then known to him only by character; but having diſtinguiſhed himſelf in America, during the revolution, for his loyalty, and by teaching the unſophiſticated doctrines of the church of England to the people of America at the peril of his life, Mr Parkhurſt thought, and juſtly thought, that he could not preſent to the vacant living a man who had given better proofs of his having a due ſenſe of the duties of his office.

In the year 1754, Mr Parkhurſt married Suſanna Myſter, daughter, and, we believe, heireſs of John Myſter, Eſq; of Epſom. It was thus that he became patron of the living which he beſtowed on Mr Boucher. This lady died in 1759, leaving him a daughter and two ſons; both the ſons are now dead. In the year 1761, he married again Millicent Northey, daughter of Thomas Northey, Eſq; by whom he had one daughter, now married to the Rev. Joſeph Thomas.

In the year 1753, he began his career of authorſhip, by publiſhing, in 8vo, "A friendly Addreſs to the Rev. Mr John Weſley, in relation to a principal Doctrine maintained by him and his aſſiſtants." This work we have not ſeen; but though we have no doubt of its value, we may ſafely ſay that it was of very little importance, when compared with his next publication, which was "An Hebrew and Engliſh Lexicon, without Points; to which is added, a methodical Hebrew Grammar, without Points, adapted to the uſe of Learners, 1762," 4to. To attempt a vindication of all the etymological and philoſophical diſquiſitions which are ſcattered through this dictionary, would be very fruitleſs; but it is not perhaps too much to ſay, that we have nothing of the kind equal to it in the Engliſh language. He continued, however, to correct and improve it; and in 1778 another edition of it came out much enlarged, and a third in 1792.

His philological ſtudies were not confined to the Hebrew language; for he publiſhed a Greek and Engliſh Lexicon to the New Teſtament; to which is prefixed, a plain and eaſy Greek Grammar, 1769, 4to; a ſecond edition, 1794: and at his death there was in the preſs a new edition of both theſe lexicons, in a large 8vo, with his laſt corrections; for he continued to reviſe, correct, add to, and improve, theſe works, till within a few weeks of his death. As, from their nature, there cannot be ſuppoſed to be any thing in dictionaries that is particularly attractive and alluring, this continued increaſing demand for theſe two ſeems to be a ſufficient proof of their merit.

He publiſhed, "The Divinity and Pre-exiſtence of our Lord and Saviour Jeſus Chriſt, demonſtrated from Scripture; in anſwer to the firſt Section of Dr Prieſtley's Introduction to the Hiſtory of Early Opinions concerning Jeſus Chriſt; together with Strictures on ſome other Parts of the Work, and a Poſtſcript relating to a late Publication of Mr Gilbert Wakefield, 1787," 8vo. This work was very generally regarded as completely performing all that its title-page promiſed; and accordingly the whole edition was ſoon ſold off. The brief, evaſive, and very unſatisfactory notice taken of this able pamphlet by Dr Prieſtley, in "A Letter to Dr Horne," &c. ſhewed only that he was unable to anſwer it.

Mr Parkhurſt was a man of very extraordinary independency of mind and firmneſs of principle. In early life, along with many other men of diſtinguiſhed learning, it was alſo objected to him, that he was an Hutchinſonian; and on this account alone, in common with them, it has been ſaid that he was neglected and ſhunned.

There is not, in the hiſtory of the times, ſays the biographer already quoted, a circumſtance more difficult to be accounted for than the unmerited, but increaſing, diſcountenance ſhewn to thoſe perſons to whom Hutchinſonianiſm was then objected. Methodiſts, Papiſts, and ſectaries of any and of every name, all ſtood a better chance of being noticed and eſteemed than Hutchinſonians. Had it even been proved that the few peculiar tenets by which they were diſtinguiſhed from other Chriſtians were erroneous, the oppoſition they experienced might have been deemed *hard meaſure*, becauſe even their opponents allowed their principles to be inoffenſive, and themſelves to be learned.

Is this a fair ſtate of the caſe? We think not. The early Hutchinſonians had imbibed all the peculiar notions of their maſter, and maintained them with a degree of acrimony which would have diſgraced any cauſe. Being in general very little acquainted with the higher mathematics, as Mr Hutchinſon himſelf ſeems likewiſe to have been, they cenſured dogmatically works which, without that knowledge, they could not fully underſtand; whilſt they maintained, with equal dogmatiſm, as matters of fact, hypotheſes, which a moderate ſhare of mathematical ſcience would have ſhewn them to be impoſſible. Had they ſtopt here, no harm would have been done; they might have enjoyed their favourite notions in peace: but unfortunately they accuſed of Atheiſm, Deiſm, or Socinianiſm, all who thought not exactly as *they* thought, both in natural philoſophy, and in theology. Becauſe Newton and Clarke had demonſtrated that the motions of the planets cannot be the effect of the impulſion of any material fluid, Hutchinſon, with ſome of his followers, affirmed, that theſe two illuſtrious men had entered into a ſerious deſign to overturn the Chriſtian religion, and eſtabliſh in England the worſhip of the Heathen Jupiter, or the Stoical *anima mundi*. Becauſe the Biſhops Pearſon, Bull, and others, who had uniformly been conſidered as the ableſt defenders of the Catholic faith, thought not exactly as Hutchinſon thought of the filiation of the Son of God, they were condemned by the pupils of his ſchool as *Arians*, or at leaſt *Semi-arians*, and the writer of this ſketch has heard a living Hutchinſonian pronounce the ſame cenſure, and for the ſame reaſon, on the preſent illuſtrious Biſhop of Rocheſter, and the no leſs illuſtrious Whitaker.

That men, who thus condemned all that before them had been deemed great and good in phyſical ſcience and Chriſtian theology, ſhould meet with ſome diſcountenance while they continued of ſuch a ſpirit, needs not ſurely excite much wonder; but that the diſcountenance is increaſing, we believe not be true. The Hutchinſonians, as ſoon as they became leſs violent againſt thoſe who differed from them, had their ſhare of preferment, in proportion to their number, with others; and we doubt not they will continue to have it, while they allow that a man may be no heretic, though he believe not Mr Hutchinſon to have been infallible. The late excellent Biſhop Horne was an avowed Hutchinſonian, though not an outrageous one like Julius Bate; and we have been told, and have reaſon to believe, that the Biſhop of St Aſaph is likewiſe a moderate favourer of the ſame ſyſtem. There may be others on the epiſcopal bench; but perhaps two out of twenty-ſix is the full proportion of Hutchinſonian divines of eminence in England. It is true that Mr Parkhurſt was a man of great learning and great worth; but before we attribute his want of preferment in the church to his Hutchinſoniaſm, it is incumbent upon us to ſay why Mr Whitaker, who is no Hutchinſonian, is ſtill nothing more than the rector of Ruan-Lanyhorne.

Mr Parkhurſt, however, was not, if his biographer deſerves credit, a thorough-paced Hutchinſonian; for though he continued to read Hutchinſon's writings as long as he read at all, he was ever ready to allow, that he was oftentimes a confuſed and bad writer, and ſometimes unbecomingly violent. To have been deterred from reading the works of an author, who, with all his faults, certainly throws out many uſeful hints, for fear of being thought a Hutchinſonian, would have betrayed a puſillanimity of which Mr Parkhurſt was incapable. What he believed he was not afraid to profeſs; and never profeſſed to believe any thing which he did not very ſincerely believe. An earneſt lover of truth, he ſought it where only it is to be found—in the Scriptures (A). The ſtudy of theſe was at once the buſineſs and the pleaſure of his life; from his earlieſt to his lateſt years, he was an hard ſtudent; and had the daily occupations of every 24 hours of his life been portioned out, as it is ſaid thoſe of king Alfred were, into three equal parts, there is reaſon to believe that a deficiency would rarely have been found in the eight hours allotted to ſtudy. What the fruits have been of a life ſo conducted, few theologians, it is preſumed, need to be informed, it being hardly within the ſcope of a ſuppoſition, that any man will now ſit down to the ſtudy of the Scriptures without availing himſelf of the aſſiſtance to be obtained from his learned labours. Theſe labours ceaſed at Epſom in Surry, where this great and good man died, on March the 21ſt, 1797. Beſides the works which we have mentioned, there is in the Gentleman's Magazine, for Auguſt 1797, a curious letter of his on the Confuſion of Tongues at Babel.

Mr Parkhurſt's character may be collected with tolerable accuracy even from this imperfect ſketch of his life. His notions of church patronage do him honour; and as a farther inſtance of the high ſenſe he entertained of ſtrict juſtice, and the ſteady reſolution with which he practiſed it on all occaſions, an incident which occurred between him and one of his tenants, within theſe ten years, may here be mentioned. This man falling behind hand in the payment of his rent, which was L. 500 *per annum*, it was repreſented to his landlord that it was owing to his being over rented. This being believed to be the caſe, a new valuation was made; and it was then agreed that, for the future, the rent ſhould not be more than L.450. Juſtly inferring, moreover, that if the farm was *then* too dear, it muſt neceſſarily have been *always* too dear, unaſked, and of his own accord, he immediately ſtruck off L.50 from the commencement of the leaſe; and inſtantly refunded all that he had received more than L.450 *per annum*.

Mr Parkhurſt was in his perſon rather below the middle ſize, but remarkably upright, and firm in his gait. He was all his life of a ſickly habit: and his leading ſo remarkably ſtudious and ſedentary a life (it having, for many years, been his conſtant practice to riſe at five, and, in winter, to light his own fire) to the very verge of David's limits of the life of man, is a conſolatory proof to men of ſimilar habits, how much, under many diſadvantages, may ſtill be effected by ſtrict temperance and a careful regimen. He alſo gave leſs of his time to the ordinary interruptions of life than is common. In an hoſpitable, friendly, and pleaſant neighbourhood, he viſited little; alleging, that ſuch a courſe of life neither ſuited his temper, his health, nor his ſtudies. Yet he was of ſociable manners; and his converſation always inſtructive, often delightful: for his

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(A) This is vague language, which is the ſource of much uſeleſs controverſy, and therefore ought to be avoided. If by *truth*, in this paſſage, be meant *religious* truth, we admit the aſſertion in the only ſenſe in which we think it can have been made. If the author means *all* truth, he writes nonſenſe; for the Scriptures treat not of *geometry* or *algebra*, where truth is certainly to be found; and *we think* that they have a higher object than even *mechanics* and *aſtronomy*.

his ſtores of knowledge were ſo large, that he too has often been called a walking library. He belonged to no clubs; he frequented no public places; and there are few men who, towards the cloſe of life, may not, on a retroſpect, reflect with ſhame and ſorrow, how much of their precious time has thus been thrown away, or, perhaps, worſe than thrown away.

Like many other men of infirm and ſickly frames, Mr Parkhurſt was alſo irritable, and quick, warm, and earneſt, in his reſentments, though never unforgiving. But whether it be or be not a matter of reproach to poſſeſs a mind ſo conſtituted, it certainly is much to any man's credit to counteract and ſubdue it by an attention to the injunctions of religion. This Mr Parkhurſt effectually did: and few men have paſſed through a long life more at peace with his neighbours, more reſpected by men of learning, more beloved by his friends, or more honoured by his family.

PARKINSON (John). Of this ingenious Engliſh botaniſt, one of the firſt and moſt induſtrious cultivators of that ſcience among us, the memorials that remain are very ſcanty. He was born in 1567, was bred an apothecary, and reſided in London. He roſe to ſuch reputation in his profeſſion as to be appointed apothecary to King James I.; and, on the publication of his Theatre of Plants, he obtained from the unfortunate ſucceſſor of that prince the title of *Botanicus Regis primarius*. The time of his death cannot be exactly aſcertained; but, as his Herbal was publiſhed in 1640, and it appears that he was living at that time, he muſt have attained his 73d year.

Biog. Dict.

Parkinſon's firſt publication was, his 1. *Paradiſi in Sole Paradiſus terreſtris*, or, A Garden of all Sorts of Pleaſant Flowers which our Engliſh Ayre will permit to be nurſed up: with a Kitchen-garden of all manner of Herbes, Roots, and Fruits, for Meat or Sauſe, &c. &c. Collected by John Parkinſon apothecary, of London, 1629, folio, 612 pages. In this work the plants are arranged without any exact order: nearly 1000 plants are ſeparately deſcribed, of which 780 are figured on 129 tables, which appear to have been cut expreſsly for this work. Parkinſon was, it is conceived, the firſt Engliſh author who ſeparately deſcribed and figured the ſubjects of the flower-garden; and this book is therefore a valuable curioſity, as exhibiting a complete view of the extent of the Engliſh garden at the beginning of the 17th century. It may, perhaps, be neceſſary to inform the reader, that Paradiſus in Sole, is meant to expreſs the author's name, *Park in ſun*. 2. In 1640 he publiſhed his *Theatrum Botanicum;* or Theatre of Plants, or an Herbal of a large extent: containing therein, a more ample and exact Hiſtory and declaration of the Phyſical Herbs and Plants than are in other Authors, &c. &c. London, folio, 1746 pages. This work had been the labour of the author's life; and he tells us that, owing to "the diſaſtrous times," and other impediments, the printing of it was long retarded. Dr Pulteney is of opinion, that, allowing for the defects common to the age, Parkinſon will appear "more of an original author than Gerard or Johnſon, independent of the advantages he might derive from being poſterior to them. His theatre was carried on through a long ſeries of years, and he profited by the works of ſome late authors, which Johnſon, though they were equally in his power, had neglected to uſe. Parkinſon's deſcriptions, in many inſtances, appear to be new. He is more particular in pointing out the places of growth. Johnſon had deſcribed about 2850 plants, Parkinſon has near 3800. Theſe accumulations rendered the *Theatrum Botanicum* the moſt copious book on the ſubject in the Engliſh language; and it may be preſumed, that it gained equally the approbation of medical people, and of all thoſe who were curious and inquiſitive in this kind of knowledge."

PARODICAL Degrees, in an equation, a term that has been ſometimes uſed to denote the ſeveral regular terms in a quadratic, cubic, biquadratic, &c. equation, when the indices of the powers aſcend or deſcend orderly in an arithmetical progreſſion. Thus, $x^3 + mx^2 + nx = p$ is a cubic equation where no term is wanting, but having all its parodic degrees; the indices of the terms regularly deſcending thus, 3, 2, 1, 0.

PARRAMORE, one of the ſmall iſlands in the Atlantic Ocean, which line the eaſt coaſt of Northampton county, Virginia.—*Morse*.

PARR's *Point*, is the ſouth-eaſt point of Half-Moon bay, on the north-eaſt ſide of the iſland of St Chriſtopher's, in the Weſt-Indies. The coaſt here is rocky. —*ib.*

PARSONS (James), an excellent phyſician and polite ſcholar, was born at Barnſtaple, in Devonſhire, in March 1705. His father, who was the youngeſt of nine ſons of Colonel Parſons, and nearly related to the baronet of that name, being appointed barrack-maſter at Bolton in Ireland, removed with his family into that kingdom ſoon after the birth of his then only ſon James, who received at Dublin the early part of his education, and, by the aſſiſtance of proper maſters, laid a conſiderable foundation of claſſical and other uſeful learning, which enabled him to become tutor to Lord Kingſton. Turning his attention to the ſtudy of medicine, he went afterwards to Paris, where (to uſe his own words) "he followed the moſt eminent profeſſors in the ſeveral ſchools, as Aſtruc, Dubois, Lemery, and others; attended the anatomical lectures of the moſt famous [Hunaud and De Cat]; and chemicals at the King's Garden at St Come. He followed the phyſicians in both hoſpitals of the Hotel Dieu and La Charité, and the chemical lectures and demonſtrations of Lemery and Bouldoc; and in botany Juſſieu. Having finiſhed theſe ſtudies, his profeſſors gave him honourable atteſtations of his having followed them with diligence and induſtry, which intitled him to take the degrees of doctor and profeſſor of the art of medicine, in any univerſity in the dominions of France. Intending to return to England, he judged it unneceſſary to take degrees in Paris, unleſs he had reſolved to reſide there; and as it was more expenſive, he therefore went to the univerſity of Rheims, in Champaign, where, by virtue of his atteſtations, he was immediately admitted to three examinations, as if he had finiſhed his ſtudies in that academy; and there was honoured with his degrees June 11. 1736. In the July following he came to London, and was ſoon employed by Dr James Douglas to aſſiſt him in his anatomical works, where in ſome time he began to practiſe. He was elected a member of the Royal Society in 1740; and, after due examination, was admitted a licentiate of the college of phyſicians April 1. 1751; paying college fees and bond ſtamps of different denominations to the amount of

Biog. Dict.

L. 41 : 2 : 8, ſubject alſo to quarterage of L. 2 *per annum*. In 1755 he paid a farther ſum of L. 7, which, with the quarterage money already paid, made up the ſum of L. 16, in lieu of all future payments." On his arrival in London, by the recommendation of his Paris friends, he was introduced to the acquaintance of Dr Mead, Sir Hans Sloane, and Dr James Douglas. This great anatomiſt made uſe of his aſſiſtance, not only in his anatomical preparations, but alſo in his repreſentations of morbid and other appearances; a liſt of ſeveral of which was in the hands of his friend Dr Maty, who had prepared an *eloge* on Dr Parſons, which was never uſed, but which, by the favour of Mrs Parſons, Mr Nichols has preſerved at large. Though Dr Parſons cultivated the ſeveral branches of the profeſſion of phyſic, he was principally employed in the obſtetrical line. In 1738, by the intereſt of his friend Dr Douglas, he was appointed phyſician to the public infirmary in St Giles's. In 1739 he married Miſs Elizabeth Reynolds, by whom he had two ſons and a daughter, who all died young. Dr Parſons reſided for many years in Red Lion Square, where he frequently enjoyed the company and converſation of Dr Stukely, Biſhop Lyttleton, Mr Henry Baker, Dr Knight, and many other of the moſt diſtinguiſhed members of the Royal and Antiquarian Societies, and that of Arts, Manufactures, and Commerce; giving weekly an elegant dinner to a large but ſelect party. He enjoyed alſo the literary correſpondence of D'Argenville, Buffon, Le Cat, Beccaria, Amb. Bertrand, Valltravers, Aſcanius, Turberville Needham, Dr Garden, and others of the moſt diſtinguiſhed rank in ſcience. As a practitioner, he was judicious, careful, honeſt, and remarkably humane to the poor; as a friend, obliging and communicative; chearful and decent in converſation, ſevere and ſtrict in his morals, and attentive to fill with propriety all the various duties of life. In 1769, finding his health impaired, he propoſed to retire from buſineſs and from London; and with that view diſpoſed of a conſiderable number of his books and foſſils, and went to Briſtol. But he returned ſoon after to his old houſe, and died in it after a week's illneſs, on the 4th of April, 1770. By his laſt will, dated in October 1766, he gave his whole property to Mrs Parſons; and in caſe of her death before him, to Miſs Mary Reynolds her only ſiſter, "in recompence for her affectionate attention to him and to his wife, for a long courſe of years, in ſickneſs and in health." It was his particular requeſt, that he ſhould not be buried till ſome change ſhould appear in his corpſe; a requeſt which occaſioned him to be kept unburied 17 days, and even then ſcarce the ſlighteſt alteration was perceivable. He was buried at Hendon, in a vault which he had cauſed to be built on the ground purchaſed on the death of his ſon James, where his tomb had a very commendatory inſcription.

It would carry us beyond our uſual limits to enter into an enumeration of the many curious articles at various times communicated to the public by Dr Parſons, which may be ſeen in the Anecdotes of Bowyer. We ſhall therefore cloſe this article with an extract from Dr Maty's Eulogium: "The ſurpriſing variety of branches which Dr Parſons embraced, and the ſeveral living as well as dead languages he had a knowledge of, qualified him abundantly for the place of aſſiſtant ſecretary for foreign correſpondences, which the council of the Royal Society beſtowed upon him about the year 1750. He acquitted himſelf to the utmoſt of his power of the functions of this place, till a few years before his death, when he reſigned in favour of his friend, who now gratefully pays this laſt tribute to his memory. Dr Parſons joined to his academical honours thoſe which the Royal College of Phyſicians of London beſtowed upon him, by admitting him, after due examination, licentiate, on the firſt day of April 1751. The diffuſive ſpirit of our friend was only equalled by his deſire of information. To both theſe principles he owed the intimacies which he formed with ſome of the greateſt men of his time. The names of Folkes, Hales, Mead, Stukely, Needham, Baker, Collinſon, and Garden, may be mentioned on this occaſion, and many more might be added. Weekly meetings were formed, where the earlieſt intelligence was received and communicated of any diſcovery both here and abroad; and new trials were made, to bring to the teſt of experience the reality or uſefulneſs of theſe diſcoveries. Here it was that the microſcopical animals found in ſeveral infuſions were firſt produced; the propagation of ſeveral inſects by ſection aſcertained; the conſtancy of Nature amidſt theſe wonderful changes eſtabliſhed. His Remains of Japhet, being Hiſtorical Enquiries into the Affinity and Origin of the European Languages, are a moſt laborious performance, tending to prove the antiquity of the firſt inhabitants of theſe iſlands as being originally deſcended from Gomer and Magog, above 1000 years before Chriſt, their primitive and ſtill ſubſiſting language, and its affinity with ſome others. It cannot be denied but that there is much ingenuity, as well as true learning, in this work, which helps conviction, and often ſupplies the want of it. But we cannot help thinking that our friend's warm feelings now and then miſlead his judgment, and that ſome at leaſt of his conjectures, reſting upon partial traditions, and poetical ſcraps of Iriſh filids and Welſh bards, are leſs ſatisfactory than his tables of affinity between the ſeveral northern languages, as deduced from one common ſtock. Literature, however, is much obliged to him for having in this, as well as in many of his other works, opened a new field of obſervations and diſcoveries. In enumerating our learned friend's diſſertations, we find ourſelves at a loſs whether we ſhould follow the order of ſubjects or of time; neither is it eaſy to account for their ſurpriſing variety and quick ſucceſſion. The truth is, that his eagerneſs after knowledge was ſuch, as to embrace almoſt with equal facility all its branches, and with equal zeal to aſcertain the merit of inventions, and aſcribe to their reſpective, and ſometimes unknown, authors, the glory of the diſcovery. Many operations, which the ancients have tranſmitted to us, have been thought fabulous, merely from our ignorance of the art by which they were performed. Thus the burning of the ſhips of the Romans at a conſiderable diſtance, during the ſiege of Syracuſe, by Archimedes, would perhaps ſtill continue to be exploded, had not the celebrated M. Buffon in France ſhewn the poſſibility of it, by preſenting and deſcribing a model of a ſpeculum, or rather aſſemblage of mirrors, by which he could ſet fire at the diſtance of ſeveral hundred feet. In the contriving, indeed, though not in the executing of ſuch an apparatus, he had in ſome meaſure been foreſtalled by a writer now very little known or read. This Dr Parſons proved in a very ſatisfactory manner; and he had the pleaſure to find the French philoſopher did not refuſe to the Jeſuit his ſhare in the invention, and was not at all offended by the liberty he had taken. Another French diſcovery, I mean a new kind of painting fathered upon the ancients, was reduced to its real value, in a paper which ſhewed our author was poſſeſſed of a good taſte for the fine arts: and I am informed that his ſkill in muſic was by no means inferior, and that his favourite amuſement was the flute. Richly, it appears from theſe performances, did our author merit the honour of being a member of the Antiquarian Society, which long ago had aſſociated him to its labours. To another ſociety, founded upon the great principles of humanity, patriotiſm, and natural emulation, he undoubtedly was greatly uſeful (A). He aſſiſted at moſt of their general meetings and committees, and was for many years chairman to that of agriculture; always equally ready to point out and to promote uſeful improvements, and to oppoſe the intereſted views of fraud and ignorance, ſo inſeparable from very extenſive aſſociations. No ſooner was *this* ſociety (B) formed, than Dr Parſons became a member of it. Intimately convinced of the nobleneſs of its views, though from his ſtation in life little concerned in its ſucceſs, he grudged neither attendance nor expenſe. Neither ambitious of taking the lead, nor fond of oppoſition, he joined in any meaſure he thought right; and ſubmitted cheerfully to the ſentiments of the majority, though againſt his own private opinion. The juſt ideas he had of the dignity of our profeſſion, as well as of the common links which ought to unite all its members, notwithſtanding the differences of country, religion, or places of education, made him bear impatiently the ſhackles laid upon a great number of reſpectable practitioners: he wiſhed, fondly wiſhed, to ſee theſe broken; not with a view of empty honour and dangerous power, but as the only means of ſerving mankind more effectually, checking the progreſs of deſigning men and illiterate practitioners, and diffuſing through the whole body a ſpirit of emulation. Though by frequent diſappointments he foreſaw, as well as we, the little chance of a ſpeedy redreſs, he nobly perſiſted in the attempt; and had he lived to the final event, would undoubtedly, like Cato, ſtill have preferred the conquered cauſe to that ſupported by the gods. After having tried to retire from buſineſs and from London, for the ſake of his health, and having diſpoſed of moſt of his books with that view, he found it inconſiſtent with his happineſs to forſake all the advantages which a long reſidence in the capital, and the many connections he had formed, had rendered habitual to him. He therefore returned to his old houſe, and died in it, after a ſhort illneſs, April 4. 1770. The ſtyle of our friend's compoſition was ſufficiently clear in deſcription, tho' in argument not ſo cloſe as could have been wiſhed. Full of his ideas, he did not always ſo diſpoſe and connect them together, as to produce in the minds of his readers that conviction which was in his own. He too much deſpiſed thoſe additional graces which command attention when joined to learning, obſervation, and found reaſoning. Let us hope that his example and ſpirit will animate all his colleagues; and that thoſe practitioners who are in the ſame circumſtances will be induced to join their brethren, ſure to find amongſt them thoſe great bleſſings of life, freedom, equality, information, and friendſhip. As long as theſe great principles ſhall ſubſiſt in this ſociety, and I truſt they will outlaſt the longeſt liver, there is no doubt but the members will meet with the reward honeſt men are ambitious of, the approbation of their conſcience, the eſteem of the virtuous, the remembrance of poſterity."

PARTY ARCHES, in architecture, are arches built between ſeparate tenures, where the property is intermixed, and apartments over each other do not belong to the ſame eſtate.

PARTY Walls, are partitions of brick made between buildings in ſeparate occupations, for preventing the ſpread of fire. Theſe ſhould be thicker than the external walls; and their thickneſs in London is regulated by act of parliament of the 14th of George III.

PARSONSFIELD, a townſhip of the Diſtrict of Maine, in York county, ſituated on the New Hampſhire line, between great and Little Oſſipee rivers; and is 118 miles north of Boſton. It was incorporated in 1785, and contains 655 inhabitants.—*Morse.*

PARTIDO, a ſmall iſland, under the high hill of St Martin, in the ſouth-weſt part of Campeachy Gulf. It lies in the fair way acroſs the bay from Cape Catoche to Vera Cruz.—*ib.*

PARTRIDGEFIELD, a townſhip of Maſſachuſetts, in Berkſhire county, 26 miles W. N. W. of Northampton, and 128 weſtward of Boſton. It was incorporated in 1775, and contains 1041 inhabitants.—*ib.*

PASCAGOULA, a river of the Georgia Weſtern Territory, which purſues a S. by E. courſe through Weſt Florida, and empties into the Gulf of Mexico, by ſeveral mouths, which together occupy a ſpace of 3 or 4 miles; which is one continued bed of oyſter-ſhells, with very ſhoal water. The weſternmoſt branch has 4 feet water, and is the deepeſt. After croſſing the bar, there is from 3 to 6 fathoms water for a great diſtance, and the river is ſaid to be navigable more than 150 miles. The ſoil on this river, like that on all the others that paſs through Georgia into the Gulf of Mexico, grows better as you advance to its ſource.—*ib.*

PASCAGOULA, an Indian village on the E. ſide of the river Miſſiſſippi, which can furniſh about 20 warriors. It is about 10 miles above the Tonica village.—*ib.*

PASCATAQUA, or *Piſcataqua*, is the only large river, whoſe whole courſe is in New Hampſhire. Its head is a pond in the N. E. corner of the town of Wakefield, and its general courſe thence to the ſea is S. S. E. about 40 miles. It divides New Hampſhire from York county, in the Diſtrict of Maine, and is called Salmon-Fall river, from its head, to the lower falls at Berwick, where it aſſumes the name of Newichawannock, which it bears till it meets with Cochecho river, which comes from Dover, when both run together

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(A) The Society for the Encouragement of Arts, Manufactures, and Commerce. He likewiſe was aſſociated to the Economical Society at Berne, Dec. 26. 1763.

(B) A Medical Society inſtituted by Dr Fothergill, and other reſpectable phyſicians, licentiates, in vindication of their privileges; where, it ſhould ſeem, this eulogy was intended to be pronounced.

together in one channel to Hilton's Point, where the weſtern branch meets it: from this junction to the ſea, the river is ſo rapid that it never freezes; the diſtance is 7 miles, and the courſe generally from S. to S. E. The weſtern branch is formed by Swanſcot river, which comes from Exeter, Winnicot river, which comes through Greenland, and Lamprey river, which divides Newmarket from Durham; theſe empty into a bay, 4 miles wide, called the Great Bay. The water, in its further progreſs, is contracted into a leſſer bay, and then it receives Oyſter river, which runs through Durham, and Back river, which comes from Dover, and at length meets with the main ſtream at Hilton's Point. The tide riſes into all theſe bays, and branches as far as the lower falls in each river, and forms a moſt rapid current, eſpecially at the ſeaſon of the freſhets, when the ebb continues about two hours longer than the flood; and were it not for the numerous eddies, formed by the indentings of the ſhore, the ferries would then be impaſſable. At the lower falls in the ſeveral branches of the river, are landing places, whence lumber and other country produce is tranſported, and veſſels or boats from below diſcharge their lading; ſo that in each river there is a convenient trading place, not more than 12 or 15 miles diſtant from Portſmouth, with which there is conſtant communication by every tide. Thus the river, from its form, and the ſituation of its branches, is extremely favourable to the purpoſes of navigation and commerce. A light-houſe, with a ſingle light, ſtands at the entrance of Piſcataqua harbour, in lat. 43 4 N. and long. 70 41.—*ib.*

PASPAYA, a juriſdiction in the archbiſhoprick of La Plata, about 40 leagues to the S. of the city of that name. It is mountainous but abounds in grain, pulſe, and fruits.—*ib.*

PASQUOTANK, a county of North Carolina, in Edenton diſtrict, N. of Albemarle Sound. It contains 5,497 inhabitants, including 1623 ſlaves.—*ib.*

PASQUOTANK, a ſmall river of North Carolina, which riſes in the Great Diſmal Swamp, and, paſſing by Hertford, falls into Albemarle Sound.—*ib.*

PASSAGE *Fort*, a ſmall town of the iſland of Jamaica, ſituated in the road between Port Royal and Spaniſh Town, 7 miles S. E. of the latter, and at the mouth of Cobre river, where is a fort of 10 or 12 guns. It has a briſk trade, and contains about 400 houſes, the greateſt part of them houſes of entertainment.—*ib.*

PASSAGE *Iſland* lies acroſs the mouth of the river Cobeca, near the N. W. part of the iſland of Porto Rico. The harbour for ſhips is at the E. end of this iſland.—*ib.*

PASSAGE *Iſlands*, Great and Little, two of the Virgin Iſlands, in the Weſt Indies, near the E. end of the iſland of Porto Rico. N. lat. 18 20, W. long. 64 5.—*ib.*

PASSAGE *Point*, in the Straits of Magellan, lies at the W. end of Royal Reach, and 5 leagues W. N. W. of Forteſcue's Bay. S. lat. 53 45, W. long. 73 40.—*ib.*

PASSAIK, or *Paſaick*, is a very crooked river. It riſes in a large ſwamp in Morris county, New Jerſey, and its courſe is from W. N. W. to E. S. E. until it mingles with the Hackinſak at the head of Newark Bay. It is navigable about 10 miles, and is 230 yards wide at the ferry. The cataract, or Great Falls, in this river, is one of the greateſt natural curioſities in the ſtate. The river is about 40 yards wide, and moves in a ſlow, gentle current, until coming within a ſhort diſtance of a deep cleft in a rock, which croſſes the channel, it deſcends and falls above 70 feet perpendicular, in one entire ſheet, preſenting a moſt beautiful and tremendous ſcene. The new manufacturing town of Patterſon is erected on the Great Falls of this river; and its banks are adorned with many elegant country ſeats. It abounds with fiſh of various kinds. There is a bridge 500 feet long, over this river, on the poſt-road from Philadelphia to New York.—*ib.*

PASSAMAQUODDY, a bay and river, near which is the diviſion line between the Britiſh province of New Brunſwick and the United States of America. The iſland of Campo Bello, in the N. Atlantic Ocean, is at the middle or W. paſſage of the bay, in lat. 44 50 N. and long. 66 46 W. The diſtance from Croſs Iſle, Machias, to Weſt Paſſamaquoddy Head, is 9 leagues N. E. by E.; and from the Head over the bar to Allen's Iſle, N. N. W. 2 leagues. When you come from the S. W. and are bound into Weſt Paſſamaquoddy, you muſt give the Seal Rocks a birth of three quarters of a mile before you haul in from the harbour, as there is a whirlpool to the eaſt of them. The bay is about a league from this point. It is high water here at full and change of the moon, about the ſame time as at Boſton. There are 3 rivers which fall into this bay; the largeſt is called by the modern Indians, the Scoodick; but by De Mons and Champlain, Etchemins. Its main ſource is near Penobſcot river, and the carrying-place between the two rivers is but 3 miles. The mouth of Paſſamaquoddy river has 25 fathoms water.—*ib.*

PASSAMAQUODDY *Poſt Office*, on the above deſcribed bay, is kept at a little village at the mouth of Cobſcook river, 17 miles this ſide Brewer's, the eaſternmoſt poſt-office in the United States, 20 N. E. of Machias, 378 N. E. of Boſton, and 728 in a like direction from Philadelphia.—*ib.*

PASSAMAQUODDIES, a tribe of Indians who inhabit near the waters of Paſſamaquoddy Bay.—*ib.*

PASSAO, a cape on the coaſt of Peru, on the S. Pacific Ocean, under the equator. Long. 78 50 W.—*ib.*

PASSIGRAPHY, the art of writing on any ſubject ſo as to be underſtood by all nations (See *Univerſal Characters* in this *Supplement*). In France, where every thing is admired that is new, and every vagary of the imagination of a pretended philoſopher thought practicable, a propoſal has lately been made to introduce one univerſal language into the world, conſtructed by a few metaphyſicians on the laws of human thought. And to this language, in its written form, is to be given the name of *paſſigraphy*. Such readers as think this idle dream worthy their attention (which is far from being the caſe with us), will find ſome ingenious thoughts on the hiſtory of a philoſophic language, in the 2d volume of *Nicholſon's Journal of Natural Philoſophy, &c.*

PASSO MAGNO, a river of Florida, in lat. 36 N.—*Morse.*

PASSUMPSICK, a ſmall river of Vermont, runs a ſouthern courſe and empties into Connecticut river, below the Fifteen Mile Falls, in the town of Barnet.—*ib.*

PASSYUNK, a townſhip in Philadelphia county, Pennſylvania.—*ib.*

PASTO, or *St Juan de Paſto*, a town of Popayan in S. America. N. lat. 1 50, W. long. 76 55.—*ib.*

PATAGOA, a river on the coaſt of Brazil, which enters the ocean S. W. of Rio Janeira.—*ib.*

PATAVIRCA, a town of Peru, in the juriſdiction of Santa, or Guarmey, conſiſting of about 60 houſes. It lies on the road leading from Paita to Lima, 67 miles north of that city. About three quarters of a league from this town, and near the ſea-coaſt, are ſtill remaining ſome huge walls of unburnt bricks, being the ruins of a palace of one of the Indian princes. Its ſituation correſponds with the tradition; having on one ſide, a moſt fertile and delightful country, and on the other, the refreſhing proſpect of the ſea.—*ib.*

PATAZ, a juriſdiction in the dioceſe of Truxillo, in S. America. It is ſituated among the mountains, and has a variety of products, of which gold is the chief.—*ib.*

PATEHUCA, or *Patioca*, a town of Mexico, in N. America, having a ſilver mine in its vicinity. N. lat. 21, W. long. 99 58.—*ib.*

PATH OF THE VERTEX, a term frequently uſed by Mr Flamſteed, in his doctrine of the Sphere, denoting a circle, deſcribed by any point of the earth's ſurface, as the earth turns round its axis. This point is conſidered as vertical to the earth's centre; and is the ſame with what is called the vertex or zenith in the Ptolomaic projection.

PATIENCE, an iſland in Narraganſet Bay, Rhode Iſland, and lies ſouth-eaſt of Warwick Neck, three-fourths of a mile. It is about 2 miles long, and 1 broad.—*Morse.*

PATOWMACK, or *Potomack*, a large and noble river which riſes by two branches, the northern and the ſouthern, which originate in and near the Alleghany Mountains, and forms, through its whole courſe, part of the boundary between the ſtates of Virginia and Maryland. Its courſe is N. E. to Fort Cumberland, thence turning to the E. it receives Conecocheague Creek from Pennſylvania; then purſuing a ſouth-eaſt courſe, it receives the Shenandoah from the S. W. after this it runs a S. E. and S. courſe, till it reaches Maryland Point; thence to its mouth it runs ſouth-eaſterly. In its courſe it receives ſeveral conſiderable ſtreams. The diſtance from the Capes of Virginia to the termination of the tide water in this river is above 300 miles; and navigable for ſhips of the greateſt burden, nearly that diſtance. From thence this river, obſtructed by 4 conſiderable falls, extends through a vaſt tract of inhabited country towards its ſource. Early in the year 1785, the legiſlatures of Virginia and Maryland paſſed acts to encourage opening the navigation of this river. It was eſtimated that the expenſe of the works would amount to £50,000 ſterling, and 10 years were allowed for their completion. Great part is already finiſhed; and the whole it is expected will be completed within a few years, according to the report of the engineers to the Patowmack Company. This noble river paſſes by many flouriſhing towns; the chief of which are, Shepherdſtown, Georgeſtown, Waſhington City, Alexandria, New Marlborough, and Charleſtown, or Port Tobacco. It is 7½ miles wide at its mouth; 4½ at Nomony Bay; 3 at Aquia; 1½ at Hallooing Point; and 1¼ at Alexandria. Its ſoundings are 7 fathoms at the mouth; 5 at St George's Iſland; 4½ at Lower Matchodic; 3 at Swan's Point, and thence up to Alexandria. The tides in the river are not very ſtrong, excepting after great rains, when the ebb is pretty ſtrong; then there is little or no flood, and there is never more than 4 or 5 hours flood, except with long and ſtrong ſouth winds. In order to form juſt conceptions of this inland navigation, it would be requiſite to notice the long rivers which empty into the Patowmack, and ſurvey the geographical poſition of the weſtern waters. The diſtance of the waters of the Ohio to Patowmack, will be from *fifteen* to *forty* miles, according to the trouble which will be taken to approach the new navigations. The upper part of this river, until it paſſes the Blue Ridge, is called, in Fry and Jefferſon's map, *Cohongoronto*.—*ib.*

PATRICK's, *St*, a ſmall town, the chief of Camden county, Georgia, ſituated on Great Satilla river, about 32 miles from its mouth, and the ſame diſtance north-weſterly of the town of St Mary's.—*ib.*

PATTERSON, a town in Bergen county, New Jerſey, called ſo in honour of the governor of the ſtate of that name, and now one of the judges of the ſupreme federal court. It was eſtabliſhed in conſequence of an act of the legiſlature of New Jerſey, in 1791, incorporating a manufacturing company with peculiar privileges. Its ſituation on the Great Falls of Paſſaic river, is healthy and agreeable. It now contains about 50 dwelling-houſes, independent of thoſe appropriated for the machinery; and it is certainly one of the moſt convenient ſituations for a manufacturing town of any on the continent. This company was incorporated to encourage all kinds of manufactures, and the ſum of 500,000 dolls. was ſoon ſubſcribed; but for want of experience, and a proper knowledge of the buſineſs, much was expended to little purpoſe; and they were at laſt reduced to the neceſſity of having recourſe to a lottery to aſſiſt them in carrying their plan into execution. It is ſaid that matters are now conducted more judiciouſly, and that the undertaking promiſes to be uſeful to the public, and beneficial to the proprietors. It is 19 miles N. E. of Morriſtown, 10 N. of Newark, and 100 N. E. by N. of Philadelphia. N. lat. 40 12, W. long. 74 57.—*ib.*

PATUCKET, a ſmall village about four miles N. E. of Providence, a buſy place of conſiderable trade, and where manufactures of ſeveral kinds are carried on with ſpirit. Through this village runs Patucket, or Pawtucket river, which empties into Seekhonk river at this place. The river Patucket, called more northerly Blackſtone's river, has a beautiful fall of water, directly over which, a bridge has been built on the line which divides the commonwealth of Maſſachuſetts from the ſtate of Rhode Iſland; diſtant about 40 miles S. by W. of Boſton. The confluent ſtream empties into Providence river about a mile below Weyboſſett, or the Great Bridge. The fall, in its whole length, is upwards of fifty feet; and the water paſſes through ſeveral chaſms in a rock, which, extending diametrically acroſs the bed of the ſtream, ſerves as a dam to the water. Several mills have been erected upon theſe falls; and the ſpouts and channels which have been conſtructed to conduct the ſtreams to their reſpective wheels, and the bridge, have taken very much from the beauty and grandeur of the ſcene, which would otherwiſe have been indeſcribably charming and romantic.—*ib.*

PATUXENT, or *Patuxet*, a navigable river of Maryland, which riſes near the ſource of Patapſco river, and empties into the W. ſide of Cheſapeak Bay, between Drum and Hog Iſland Points, 15 or 20 miles N. of the mouth of the Patowmac. It admits veſſels of 250 tons to Nottingham, nearly 40 miles from its mouth, and of boats to Queen Anne, 12 miles higher. Patuxent is as remarkable a river as any in the bay, having very high land on its north ſide, with red banks or cliffs. When you double Drum Point, you come to in 2½ and three fathoms water, where you will be ſecure from all winds.—*ib.*

PAUCAR-COLLA, a juriſdiction in the biſhoprick of La Paz, in South America, bordering on Chucuito. It is ſituated in the mountains, and abounds in cattle. The air is here very cold. The ſilver mine here called Laycacota, was formerly ſo rich, that the metal was often cut out with a chiſel; but the waters having overflowed, the works, it is abandoned.—*ib.*

PAUCARTAMBO, a juriſdiction of the dioceſe of Cuſco, in S. America. It is very fruitful, and lies 80 leagues eaſtward of the city of Cuſco.—*ib.*

PAUKATUCK, a ſmall river which empties into Stonington harbour, and forms a part of the diviſion line between Connecticut and Rhode Iſland.—*ib.*

PAUL's BAY, *St*, on the N. W. ſhore of the river St Lawrence, in N. America, is about 6 leagues below Cape Torment, where a chain of mountains of 400 leagues in length terminate from the weſtward.—*ib.*

Paul's Bay, *St*, on the N. W. coaſt of Newfoundland Iſland. N. lat. 49 50, W. long. 57 55.—*ib.*

PAUL's ISLAND, *St*, an iſland in the ſtrait between Newfoundland and Cape Breton Iſlands. It is about 15 miles north-eaſt of North Cape, in Cape Breton. N. lat. 47 13, W. long. 60 2.—*ib.*

PAUL, *St*, a town of Brazil, S. America, in the captainſhip of St Vincent. It is a kind of independent republic, compoſed of the banditti of ſeveral nations. However, they pay a tribute of gold to the king of Portugal. It is ſurrounded by inacceſſible mountains and thick foreſts. S. lat. 23 25, W. long. 45 52.—*ib.*

Paul, *St*, a town of N. America, in New Mexico, ſituated at the confluence of the two main head branches of the Rio Bravo.—*ib.*

Paul, *St*, the moſt ſoutherly of the Pearl Iſlands, in the Gulf of Panama, S. America. In the north ſide is a ſafe channel; where, if neceſſary, there is a place for careening ſhips.—*ib.*

Paul's, *St*, a pariſh in Charleſton diſtrict, S. Carolina, containing 3 433 inhabitants; of whom 276 are whites, and 3,202 ſlaves.—*ib.*

PAULINGSTOWN, or *Pawling*, a townſhip in Dutcheſs county, New York, lying on the weſtern boundary of Connecticut, and has South and Eaſt Town on the ſouth. In 1790, it contained 4,330 inhabitants, of whom 42 were ſlaves. In 1796, there were 560 of the inhabitants qualified electors.—*ib.*

PAULSBURGH, a townſhip in Grafton county, New Hampſhire, on the head waters of Amonooſuck river, and through which paſſes Androſcoggin river.—*ib.*

PAULUS *Hook*, in Bergen county, New Jerſey, is on the weſt bank of Hudſon river, oppoſite New York city, where the river is 2,000 yards wide. Here is the ferry, which is perhaps more uſed than any other in the United States. This was a fortified poſt in the late war. In 1780 the froſt was ſo intenſe, that the paſſage acroſs the river here was practicable for the heavieſt cannon.—*ib.*

PAWLET, a townſhip in Rutland county, Vermont, having 1,458 inhabitants. It ſtands on the New York line, has Wells on the north, and Rupert, in Bennington county, on the ſouth, and is watered by Pawlet river, which joins Wood creek and the confluent ſtream, falls in South Bay at Fiddler's Elbow. Hayſtack Mountain is in this townſhip.—*ib.*

PAWTUCKET *Falls*, in Merrimack river, are in the townſhip of Dracut.—*ib.*

PAWTUXET, a village in the townſhip of Cranſton, Providence county, Rhode Iſland.—*ib.*

PAXAROS, an iſland on the coaſt of California, in the N. Pacific Ocean. N. lat. 30 18, W. long. 120 45.—*ib.*

PAXTON, *Upper* and *Lower*, two townſhips in Dauphin county, Pennſylvania.—*ib.*

Paxton, a townſhip of Maſſachuſetts, ſituated in Worceſter county, 8 miles weſt of Worceſter, and 55 ſouth-weſterly of Boſton. It was incorporated in 1765, and contains 558 inhabitants.—*ib.*

PAYJAN, a ſmall town in the juriſdiction of Truxillo, in Peru, 8 leagues S. of St Pedro.—*ib.*

PAYRABA, a town and captainſhip in the northern diviſion of Brazil.—*ib.*

PAYTA, or *Paita*, a ſmall ſea port of Quito, on the coaſt of Peru, with an excellent harbour, 11 leagues north of the iſland called Lobos de Payta. Ships from Acapulco, Sonſonnate, Realeijo, and Panama, to Collao, can only touch and refreſh here; and the length of their voyages, by reaſon of the winds being moſt of the year againſt them, occaſions the port to be very much frequented. Yet ſo parched is the ſituation of Payta, that it affords little beſides fiſh, a few goats and freſh water; their chief proviſions being furniſhed by Colan and Piura, the one 3, and the other 14 leagues diſtant. The bay is defended by a fort, and it is ſo ſituated that even muſkets alone can hinder boats from landing, being under a pretty high hill, on the ſummit of which is another fort, that commands the town and lower fort. It had only a fort with 8 guns, when Commodore Anſon took it in 1741. He burnt the town, in which was merchandize to the value of a million and a half of dollars, becauſe the governor refuſed to ranſom it. The plunder, in dollars and plate, amounted to £30,000 ſterling. It was plundered and burnt by Capt. Cavendiſh, in 1587, and by George Spilberg in 1615. There is anchorage in 10½ fathoms about a mile and a half from the town. S. lat. 5 15, W. long. 80 55.—*ib.*

PAZ, *La*, a ſmall juriſdiction of the audience of Charcas, in Peru, S. America. It is ſituated in the mountains, one of which, called Illimani, contains, in all human probability, immenſe riches, for a crag of it being broken off ſome years ſince by a flaſh of lightning, ſuch a quantity of gold was found among the fragments, that it was ſold for ſome time at La Paz for eight pieces of eight per ounce. But the ſummit of this mountain being perpetually covered with ice and ſnow, no attempt has been made to open a mine. —*ib.*

PAZ, *La*, a city of Peru, and capital of the above juriſdiction, is ſituated eaſtward of the lake Titicaca, on the ſide of a valley, among the breaches of the mountains, through which a pretty large river flows. In freſhets, the current of the river forces along huge maſſes of rocks, with ſome grains of gold. In the year 1730, an Indian, while waſhing his feet in the river, found a lump of gold of ſuch a ſize, that the Marquis de Caſtel Fuerte gave 12,000 pieces of eight for it, and ſent it to Spain as a preſent worthy the curioſity of his ſovereign. This city contains, beſides the cathedral, many public edifices, and about 20,000 inhabitants. It is 180 miles north of La Plata, and 350 ſouth-eaſt of Cuſco. S. lat. 15 59, W. long. 64 30.—*ib.*

PAZARO, a cape of N. America, on the W. ſide of the peninſula of California, towards the ſouth end of it, in about lat. 24 N. and long. 113 W.—*ib.*

PAZQUARO, a lake in Mexico, or New Spain.—*ib.*

PEACHAM, a townſhip in Caledonia county, Vermont, lies W. of Barnet on Connecticut river. It contains 365 inhabitants.—*ib.*

PEACOCK, a townſhip in Buck's county, Pennſylvania.—*ib.*

PEAKS OF OTTER are thought to be the higheſt part of the Blue Ridge, or perhaps any other in North America, meaſuring from their baſe. The height is 4,000 feet; which, however, is not one fifth of the height of the mountains of South America.—*ib.*

PEARL FISH, is commonly conſidered as an *aſcidia* (ſee MYTILUS, *Encycl.*); but this is denied by a late author, who ſeems to have paid great attention to the pearl-fiſhery at Ceylon. It has never, he ſays, been accurately deſcribed. It does not reſemble the *aſcidia* of Linnæus; and as he thinks it may form a new genus, he gives the following account of it:

" The fiſh is faſtened to the upper and lower ſhells by two white flat pieces of muſcular ſubſtance, which have been called ears, and extend about two inches from the thick part of the body, growing gradually thinner. The extremity of each ear lies looſe, and is ſurrounded by a double brown fringed line. Theſe lie almoſt the third part of an inch from the outer part of the ſhell, and are continually moved by the animal. Next to theſe above, and below, are ſituated two other double fringed moveable ſubſtances, like the bronchiæ of a fiſh. Theſe ears and fringes are joined to a cylindrical piece of fleſh of the ſize of a man's thumb, which is harder and of a more muſcular nature than the reſt of the body. It lies about the centre of the ſhells, and is firmly attached to the middle of each. This, in fact, is that part of the pearl fiſh which ſerves to open and ſhut the ſhells. Where this column is faſted, we find on the fleſh deep impreſſions, and on the ſhell various nodes of round or oblong forms, like imperfect pearls. Between this part and the hinge (*cardo*) lies the principal body of the animal, ſeparated from the reſt, and ſhaped like a bag. The mouth is near the hinge of the ſhell, enveloped in a veil, and has a double flap or lip on each ſide; from thence we obſerve the throat (*æſophagus*) deſcending like a thread to the ſtomach. Cloſe to the mouth there is a curved browniſh tongue, half an inch in length, with an obtuſe point; on the concave ſide of this deſcends a furrow, which the animal opens and ſhuts, and probably uſes to convey food to its mouth. Near its middle are two bluiſh ſpots, which ſeem to be the eyes. In a pretty deep hole, near the baſe of the tongue, lies the beard (*byſſus*), faſtened by two fleſhy roots, and conſiſting of almoſt 100 fibres, each an inch long, of a dark green colour, with a metallic luſtre; they are undivided, parallel, and flattened. In general, the *byſſus* is more than three quarters of an inch without the cleft (*rima*); but if the animal is diſturbed, it contracts it conſiderably. The top of each of theſe threads terminates in a circular gland or head, like the *ſtigma* of many plants. With this *byſſus* they faſten themſelves to rocks, corals, and other ſolid bodies; by it the young pearl-fiſh cling to the old ones, and with it the animal procures its food, by extending and contracting it at pleaſure. Small ſhell fiſh, on which they partly live, are often found clinging to the former. The ſtomach lies cloſe to the root of the beard, and has, on its lower ſide, a protracted obtuſe point. Above the ſtomach are two ſmall red bodies, like lungs; and from the ſtomach goes a long channel or gut, which takes a circuit round the muſcular column above-mentioned, and ends in the anus, which lies oppoſite to the mouth, and is covered with a ſmall thin leaf, like a flap. Though the natives pretend to diſtinguiſh the ſexes by the appearance of the ſhell, calling the flat ones males, and thoſe which are thick, concave, and vaulted, females, our author, on a cloſe inſpection, could not perceive any viſible ſexual difference."

The pearls are only in the ſofter part of the animal, and never in the firm muſcular column above-mentioned. They are found, in general, near the earth, and on both ſides of the mouth. From the appearance of the ſhell a judgment may be formed, with greater or leſs probability, whether it contains pearls or not. Thoſe which have a thick calcareous cruſt upon them, to which *ſerpulæ* (ſea tubes) *Tubuli marini irregulariter intorti*, *Criſta gali Chamar lazuras*, *Lepas tintinabulum*, *Madreporee*, *Milipore*, *Cellipore*, *Gorgontæ*, *Spongiæ*, and other Zoophytes, are faſtened, have arrived at their full growth, and commonly contain the beſt pearls; but thoſe that appear ſmooth, contain either none, or ſmall ones only.

In the article (*Encycl.*) intitled, *Manner of Fiſhing for* PEARLS *in the Eaſt Indies*, we have moſt unaccountably ſaid, that " the beſt divers will keep under water near *half an hour*, and the reſt not leſs than a quarter!" This is a very great miſtake; for M. *Le Beck* aſſures us, that the time during which a diver is able to remain under water ſeldom exceeds two minutes; and that, even after that ſhort period, he diſcharges, on emerging from the ſea, a quantity of water, and ſometimes a little blood, from his mouth and noſe. We have mentioned the danger which the divers run of becoming a prey to monſtrous fiſhes. Theſe fiſhes are ſharks; of which ſuch a dread is juſtly entertained, that the moſt expert divers will not on any account, deſcend, till the conjurer has performed his ceremonies of enchantment. Theſe conſiſt in a number of prayers, learned by heart, that nobody, probably not even the conjuror himſelf, underſtands, which he, ſtanding on the ſhore, continues muttering and grumbling from ſun riſe until the boats return. During this period, he is obliged to abſtain from food and ſleep, otherwiſe his prayers would have no avail: he is, however, allowed to drink; which privilege he indulges in a high degree, and is frequently ſo giddy, as to be rendered very unfit for devotion. Some of the conjurers accompany the divers in their boats; which pleaſes them very much, as they have their protectors near at hand.

Pearl, a ſmall iſle or ſhoal in the Weſt-Indies, in lat. 14 53 N. and long. 79 13 W.—*Morse.*

Pearl, an iſland in the Gulf of Mexico, towards the mouth of the Miſſiſſippi, a few leagues from Dauphin Iſland; about 6 or 7 miles in length, and 4 in breadth. —*ib.*

Pearl *Iſlands*, in the Bay of Panama, called alſo King Iſlands, ſituated in the S. Pacific Ocean. They are 12 leagues from the city of Panama. They are low, and produce wood, water, fruit, fowls and hogs; they alſo afford good harbours for ſhips. The northernmoſt is named Pachea; the ſouthernmoſt St Paul's. N. lat. 7 10, W. long. 81 45.—*ib.*

Pearl, a river which riſes in the Chactaw country, in the W. part of Georgia, has a ſoutherly courſe to the Gulf of Mexico, and is navigable upwards of 150 miles. Its principal mouths are near the entrance at the E. end of the Regolets, through which is the paſſage to Lake Ponchartrain. It has 7 feet at its entrance, and deep water afterwards. In 1769, there were ſome ſettlements on this river, where they raiſed tobacco, indigo, cotton, rice, Indian corn, and all ſorts of vegetables. The land produces a variety of timber, fit for pipe and hogſhead ſtaves, maſts, yards, and all kinds of plank for ſhip-building.

PEARN'S *Point*, on the W. ſide of the iſland of Antigua, and the W. ſide of Muſketo Cove. Off it are the Five Iſlands.—*ib.*

PEDEE, a river which riſes in N. Carolina, where it is called Yadkin river. In S. Carolina it takes the name of Pedee; and receiving the waters of Lynche's Creek, Little Pedee, and Black river, it joins the Wakkamaw river, near Georgetown. Theſe united ſtreams, with the acceſſion of a ſmall creek on which Georgetown ſtands, form Winyaw Bay, which about 12 miles below communicates with the ocean.—*ib.*

PEDOMETER (ſee *Encycl.*), is the name given by Mr Lewin Thugwell to an inſtrument, which is rather an improved PERAMBULATOR than the inſtrument which we have noticed by the name of Pedometer. The chief improvement made by him on the PERAMBULATOR (ſee that article, *Encycl.*) is in the ſize of the wheel, of which the circumference meaſures 16½ feet, or one pole, adapted to Gunter's conciſe method of arithmetic, and divided into 25 equal parts, correſponding to the links of his chain for land meaſuring. There is likewiſe a contrivance in Mr Thugwell's pedometer, for compelling the attention of the traveller to the inſtrument at the end of every mile. It is very ingenious, and abundantly ſimple; but we hardly think it of ſufficient importance to fill the ſpace which a complete deſcription of it would occupy in this Work. It is fully deſcribed in the *Letters and Papers of the Bath and Weſt of England Society, for the Encouragement of Agriculture;* and likewiſe in the 6th volume of the *Repertory of Arts and Manufactures.*

PEDRA *Shoals*, in the Weſt-Indies, extend from lat. 17 20 to 30 N. and from long. 79 9 to 79 17 W. —*Morse.*

PEDRAS *Point*, on the coaſt of Brazil, is 7 leagues E. S. E. from the ſtrait of St John's Iſland, and 75 from Cape North. Alſo a point on the ſame coaſt 10 leagues W. N. W. of Brandihi Bay.—*ib.*

Pedras, a river on the N. W. ſide of Punta des Pedras, at the ſouthern extremity of Amazon river.—*ib.*

PEDRO, *St*, a town in the juriſdiction of Lambeyque, in Peru, conſiſting of 130 houſes, moſtly inhabited by Indian families. It is waſhed by the river Pacaſmayo, which renders the country round very fertile. It is ſeated near the S. Sea, 20 leagues from Lambeyque. S. lat. 7 25 49, W. long. 78 20 15.—*ib.*

Pedro, *St*, one of the Marqueſas Iſlands, in the S. Pacific Ocean, called by the natives *Onateyo;* it is about 3 leagues in circuit, and lies S. 4½ leagues from the E. end of La Dominica. S. lat. 9 58, W. long. 158 30. —*ib.*

Pedro, *St*, a town of New-Mexico, N. America, ſituated on the S. ſide of Coral river, near the confluence of that river with the Colorado. The united ſtream runs a ſhort way ſouthward, and falls into the north part of the Gulf of California.—*ib.*

Pedro *Point*, *Great*, is on the ſouth coaſt of the iſland of Jamaica. From Portland Point to this point the courſe is W. by N. about 11 leagues. About S. ¼ E. diſtance 14 leagues from Point Pedro, lies the eaſternmoſt *Pedro Key.*—*ib.*

Pedro, *Little Point*, on the S. coaſt of the ſame iſland, lies E. of Great Pedro Point, within a ſhoal partly dry; but has 5 fathoms within and 10 on the outer edge of it.—*ib.*

Pedro *Point*, *St*, on the coaſt of Chili, is 8 leagues N. N. E. of Point Qudar, and 14 S. S. W. of Cape Galera. *Port St Pedro* is contiguous to this point.—*ib.*

Pedro, *Port St*, is ſituated S. W. of the Iſland of St Catherine, and on the S. E. coaſt of Brazil, at the entrance of the river La Plata.—*ib.*

Pedro *River*, *St*, runs weſtward to the Gulf of Mexico. Its mouth is in about lat. 21 N. and long. 98 W. —*ib.*

PEEK'S-Kill, a ſmall poſt-town in Weſt-Cheſter county, New-York, on the E. ſide of Hudſon's river, and N. ſide of the creek of its name, 5 miles from its mouth. It is 20 miles ſouth of Fiſh-Kill, and 50 northerly of New-York. In the winter of 1780, Gen. Waſhington encamped on the ſtrong grounds in this vicinity. —*ib.*

PEGUE, the ancient capital of the kingdom of the ſame name (ſee Pegu, *Encycl.*), appears to have been a quadrangle, each ſide meaſuring about a mile and a half. It was ſurrounded by a ditch and wall; which, before the latter tumbled down, and the former was filled up, muſt have furniſhed no contemptible defence. The breadth of the ditch appears to be about 60 yards; its depth, where not choked up, about ten or twelve feet; and there is ſtill in it water enough to impede an eaſtern ſiege. The wall has been at leaſt 25 feet high, and its breadth at the baſe not leſs than 40. It is compoſed of brick, badly cemented together with clay mortar, and has had on it ſmall equidiſtant baſtions, about 300 yards aſunder.

Nothing can exhibit a more ſtriking picture of deſolation than the inſide of this wall. We have elſewhere given an account of the almoſt inceſſant wars between the kings of Pegue and Birma or Barma. In the year

1757, the Birman ſovereign carried the city of Pegue by aſſault, razed every dwelling to the ground, and diſperſed, or led into captivity, all the inhabitants. The pagodas, which are very numerous, were the only buildings that eſcaped the fury of the conqueror; and of theſe the great pagoda of SHOEMADOO has alone been attended to and repaired.

This extraordinary edifice is built on a double terrace one raiſed upon another. The lower and greater terrace is about ten feet above the natural level of the ground. It is quadrangular. The upper and leſſer terrace is of a like ſhape, raiſed about 20 feet above the lower terrace, or 30 above the level of the country.

Theſe terraces are aſcended by flights of ſtone ſteps, broken and neglected. On each ſide are dwellings of the *Rahaans* or prieſts, raiſed on timbers four or five feet from the ground. Their houſes conſiſt only of a ſingle hall. The wooden pillars that ſupport them are turned with neatneſs. The roof is of tile, and the ſides of ſheathing-boards. There are a number of bare benches in every houſe, on which the *Rahaans* ſleep. They appear to have no furniture.

Shoemadoo is a pyramid, compoſed of brick and plaſter, with fine ſhell mortar, without excavation or aperture of any ſort; octagonal at the baſe, and ſpiral at the top. Six feet from the ground there is a wide ledge, which ſurrounds the baſe of the building; on the plane of which are 57 ſmall ſpires, of equal ſize, and equidiſtant. One of them meaſured 27 feet in height, and 40 in circumference at the bottom. On a higher ledge there is another row, conſiſting of 53 ſpires, of ſimilar ſhape and meaſurement. A great variety of mouldings encircles the building; and ornaments, ſomewhat reſembling the *fleur de lys*, ſurround what may be called the baſe of the ſpire. Circular mouldings likewiſe gird this part to a conſiderable height; above which there are ornaments in ſtucco, not unlike the leaves of a Corinthian capital; and the whole is crowned by a *tee*, or umbrella of open iron-work, from which riſes an iron rod with a gilded penant.

The extreme height of the building, from the level of the country, is 361 feet; and above the interior terrace, 331 feet. On the ſouth-eaſt angle of the upper terrace there are two handſome ſaloons, or *keouns*, lately erected. The roof is compoſed of different ſtages, ſupported by pillars. Captain Symes, from whoſe memoir in the Aſiatic Reſearches this account is taken, judged the length of each ſaloon to be about 60 feet, and the breadth 30. The ceiling of one of them was already embelliſhed with gold leaf, and the pillars lacquered; the other, when he ſaw it, was not completed. They are made entirely of wood. The carving on the outſide is very curious. He ſaw ſeveral unfiniſhed figures intended to be fixed on different parts of the building; ſome of them not ill ſhapen, and many exceedingly groteſque. Splendid images of Gaudma (the *Birman* object of adoration) were preparing, which he underſtood were deſigned to occupy the inſide of theſe *keouns*.

At each angle of the interior terrace is a pyramidical pagoda, 67 feet in height, reſembling, in miniature, the great pagoda. In front of the one in the ſouth-weſt corner are four gigantic repreſentations in maſonry of Palloo, or the *man deſtroyer*, half beaſt, half human, ſeated on their hams, each with a large club on the right ſhoulder.

Nearly in the centre of the eaſt face of the area are two human figures in ſtucco beneath a gilded umbrella. One ſtanding, repreſents a man with a book before him, and a pen in his hand. He is called *Thagiamee*, the recorder of mortal merits and mortal miſdeeds. The other, a female figure kneeling, is *Maha Sumdere*, the protectreſs of the univerſe, as long as the univerſe is doomed to laſt: but when the time of general diſſolution arrives, by her hand the world is to be overwhelmed, and deſtroyed everlaſtingly.

On the north ſide of the great pagoda are three large bells, of good workmanſhip, ſuſpended near the ground between pillars. Several deers horns are ſtrewed around. Thoſe who come to pay their devotions firſt take up one of the horns, and ſtrike the bell three times, giving an alternate ſtroke to the ground. This act is to announce to the ſpirit of Gaudma the approach of a ſuppliant. There are ſeveral low benches near the bottom of the pagoda, on which the perſon who comes to pray places his offering; which generally conſiſts of boiled rice, a plate of ſweetmeats, or cocoa-nut fried in oil. When it is given, the devotee cares not what becomes of it. The crows and dogs commonly eat it up in the preſence of the donor, who never attempts to prevent or moleſt the animals.

There are many ſmall pagodas on the areas of both terraces, which are neglected, and ſuffered to fall into decay. Numberleſs images of Gaudma lie indiſcriminately ſcattered. A pious Birman who purchaſes an idol, firſt procures the ceremony of conſecration to be performed by the *Rahaans*, then takes his purchaſe to whatever ſacred building is moſt convenient, and there places it either in the ſhelter of a *keoun*, or on the open ground before the temple: nor does he ever after ſeem to have any anxiety about its preſervation, but leaves the divinity to ſhift for itſelf.

From the upper ledge that ſurrounds the baſe of Shoemadoo, the proſpect of the country is extenſive and pictureſque; but it is a proſpect of Nature in her rudeſt ſtate. There are few inhabitants, and ſcarcely any cultivation. The hills of *Martaban* riſe to the eaſtward; and the *Sitang* river, winding along the plains, gives here and there an interrupted view of its waters. To the north-north-weſt, above 40 miles, are the *Galladzet* hills, whence the Pegue river takes its riſe; hills remarkable only for the noiſome effects of their atmoſphere. In every other direction the eye looks over a boundleſs plain, chequered by a wild intermixture of wood and water.

The preſent king of the Birmans has entirely altered the ſyſtem of his predeceſſors. He has turned his attention to the population and improvement, rather than the extenſion, of his dominions; and ſeems more deſirous to conciliate his new ſubjects by mildneſs, than to rule them through terror. He has abrogated ſeveral ſevere penal laws impoſed upon the *Taliens*, or Peguers: juſtice is now diſtributed impartially; and the only diſtinction at preſent between a Birman and Talien conſiſts in the excluſion of the latter from all public offices of truſt and power.

No act of the Birman government is more likely to reconcile the Taliens to the Birman yoke than the reſtoration of their ancient place of abode, and the preſervation and embelliſhment of the pagoda of Shoemadoo. So ſenſible was the king of this, as well as of the advantages that muſt accrue to the ſtate from an increaſe of culture and population, that ſome years ago he iſſued orders to rebuild Pegue, encouraged new ſettlers by liberal grants, and invited the ſcattered families of former inhabitants to return and repeople their deſerted city.

Pegue, in its renovated ſtate, ſeems to be built on the plan of the former city. It is a ſquare, each ſide meaſuring about half a mile. It is fenced round by a ſtockade, from 10 to 12 feet high. There is one main ſtreet running eaſt and weſt, which is interſected at right angles by two ſmaller ſtreets, not yet finiſhed. At each extremity of the principal ſtreet there is a gate in the ſtockade, which is ſhut early in the evening. After that hour, entrance during the night is confined to a wicket. Each of theſe gates is defended by a ſorry piece of ordnance, and a few muſqueteers, who never poſt centinels, and are uſually aſleep. There are alſo two other gates on the north and ſouth ſides of the ſtockade.

The houſes of the inhabitants of Pegue are far from commodious, agreeably to European notions of accommodation; but they are at leaſt as much ſo as the houſes of other Indian towns. There are no brick buildings in Pegue, except ſuch as belong to the king, or are dedicated to Gaudma. The king has prohibited the uſe of brick or ſtone in private buildings, from the apprehenſion, that if people got leave to build brick houſes, they might erect brick fortifications, dangerous to the ſecurity of the ſtate. The houſes, therefore, are all made of mats or ſheathing-boards, ſupported on bamboos or poſts. Being compoſed of ſuch combuſtible materials, the inhabitants are under continual dread of fire, againſt which they take every precaution. The roofs are lightly covered; and at each door ſtands a long bamboo, with a hook at the end, to pull down the thatch: alſo another pole, with a grating of ſplit bamboo at the extremity, about three feet ſquare, to ſuppreſs flame by preſſure. Almoſt every houſe has earthen pots of water on the roof. And there is a particular claſs of people, whoſe buſineſs it is to prevent and extinguiſh fires.

PEGUNNOCK, a north-weſtern branch of Paſſaik river, in New-Jerſey, which riſes in Suſſex county. The town of its name lies between it and Rockaway, another branch ſouth of this river, N. W. of Morriſtown.—*Morſe.*

PEISHCAR, in Bengal, principal in office.

PEISHCUSH, a fine, tribute, or preſent.

PELHAM, a townſhip of Maſſachuſetts, in Hampſhire county 12 miles northeaſterly of Northampton, and 85 weſt of Boſton. It was incorporated in 1742, and contains 1040 inhabitants.—*Morſe.*

PELHAM, a townſhip of Rockingham county New-Hampſhire, ſituated on the ſouth State line, which ſeparates it from Dracut in Maſſachuſetts. It lies on the E. ſide of Beaver river, 30 miles ſouthweſterly of Exeter, and 36 N. of Boſton. It was incorporated in 1746, and contains 791 inhabitants.—*ib.*

PELHAM, a townſhip of New-York, ſituated in Weſt-Cheſter county, bounded ſoutherly and eaſterly by the Sound, northerly by the north bounds of the manor of Palham, including New-City, Hart, and Appleſby's Iſlands. It contains 199 inhabitants; of whom 27 are electors, and 38 ſlaves.—*ib.*

PELICAN, *Great,* an iſland a mile long and very narrow, eaſt of the Bay of Mobile in the Gulf of Mexico. Its concave ſide is towards the eaſt end of Dauphin Iſland. Hawk's Bay lies between theſe two iſlands. *Little Pelican Iſland* is a ſmall ſand key, ſouth eaſt of Great Pelican. Its eaſtern curve meets a large ſhoal extending from Mobile Point.—*ib.*

PELICAN *Iſlands,* on the ſouth coaſt of the iſland of Jamaica, are ſituated off the point ſo called, weſtward of Port-Royal harbour.—*ib.*

PELICAN, a ſmall iſland at the ſouthweſt point of the iſland of Antigua.—*ib.*

PELICAN *Rocks,* lie in Runaway Bay, on the weſt ſide of the iſland of Antigua, towards the north-weſt. They lie under water, and are very dangerous.—*ib.*

PELICAN *Shoals,* ſmall patches of ſand banks about half a mile from the ſhore of the ſouth-weſt coaſt of the iſland of Barbadoes.—*ib.*

PELL (Dr John), an eminent Engliſh mathematician, deſcended from an ancient family in Lincolnſhire, was born at Southwick in Suſſex, March 1. 1610, where his father was miniſter. He received his grammar education at the free ſchool at Stenning in that county. At the age of 13 he was ſent to Trinity college in Cambridge, being then as good a ſcholar as moſt maſters of arts in that univerſity; but though he was eminently ſkilled in the Greek and Hebrew languages, he never offered himſelf a candidate at the election of ſcholars or fellows of his college. His perſon was handſome; and being of a ſtrong conſtitution, uſing little or no recreations, he proſecuted his ſtudies with the more application and intenſeneſs.

In 1629 he drew up the "Deſcription and Uſe of the Quadrant, written for the Uſe of a friend," in two books; the original manuſcript of which is ſtill extant among his papers in the Royal Society. And the ſame year he held a correſpondence with Mr Briggs on the ſubject of logarithms.

In 1630, he wrote *Modus ſupputandi Ephemerides Aſtronomicas, &c. ad an.* 1630 *accommodatus;* and, A Key to unlock the meaning of Johannes Trithemius, in his Diſcourſe on Steganography: which Key he imparted to Mr Samuel Hartlib and Mr Jacob Homedæ. The ſame year he took the degree of Maſter of Arts at Cambridge. And the year following he was incorporated in the univerſity of Oxford. June the 7th, he wrote A Letter to Mr Edmond Wingate on Logarithms: and, Oct. 5. 1631, *Commentationes in Coſmographiam Alſtedii.*

In 1632 he married Ithamaria, ſecond daughter of Mr Henry Reginolles of London, by whom he had four ſons and four daughters.—March 6. 1634, he finiſhed his "Aſtronomical Hiſtory of Obſervations of Heavenly Motions and Appearances;" and April the 10th, his *Ecliptica Prognoſtica,* or Foreknower of the Eclipſes, &c. In 1634 he tranſlated "The Everlaſting Tables of Heavenly motions," grounded upon the Obſervations of all Times, and agreeing with them all, by Philip Lanſberg, of Ghent in Flanders. And June the 12th, the ſame year, he committed to writing "The Manner of Deducing his Aſtronomical Tables out of the Tables and Axioms of Philip Lanſberg."—March the 9th, 1625, he wrote "A Letter of Remarks on Gellibrand's

"Mathematical Diſcourſe on the Variation of the Magnetic Needle." And the 3d of June following, another on the ſame ſubject.

His eminence in mathematical knowledge was now ſo great, that he was thought worthy of a Profeſſor's chair in that ſcience; and, upon the vacancy of one at Amſterdam in 1639, Sir William Boſwell, the Engliſh Reſident with the States General, uſed his intereſt, that he might ſucceed in that Profeſſorſhip. It was not filled up, however, till 1642, when Pell was choſen to it; and he read with great applauſe public lectures upon Diophantus.—In 1644 he printed at Amſterdam, in two pages 4to, "A Refutation of Longomontanus's Diſcourſe," *De Vera Circuli Menſura.*

In 1646, on the invitation of the Prince of Orange, he removed to the new college at Breda, as Profeſſor of Mathematics, with a ſalary of 1000 guilders a year. His *Idea Matheſeos*, which he had addreſſed to Mr Hartlib, who in 1639 had ſent it to Des Cartes and Merſenne, was printed 1650 at London, in 12mo, in Engliſh, with the title of *An Idea of Mathematics*, at the end of Mr John Durie's Reformed Library keeper. It is alſo printed by Mr Hook, in his Philoſophical Collections, N° 5. p. 127.; and is eſteemed our author's principal work.

In 1652 Pell returned to England; and in 1654 he was ſent by the protector Cromwell agent to the Proteſtant Cantons in Switzerland; where he continued till June 23. 1658, when he ſet out for England, where he arrived about the time of Cromwell's death. His negociations abroad gave afterwards a general ſatisfaction, as it appeared he had done no ſmall ſervice to the intereſt of King Charles II. and of the church of England; ſo that he was encouraged to enter into holy orders: and in the year 1661 he was inſtituted to the rectory of Fobbing in Eſſex, given him by the king. In December that year, he brought into the upper houſe of convocation the calendar reformed by him, aſſiſted by Sancroft, afterwards archbiſhop of Canterbury. In 1673 he was preſented by Sheldon, biſhop of London, to the rectory of Laingdon in Eſſex; and, upon the promotion of that biſhop to the ſee of Canterbury ſoon after, became one of his domeſtic chaplains. He was then doctor of divinity, and expected to be made a dean; but his improvement in the philoſophical and mathematical ſciences was ſo much the bent of his genius, that he did not much purſue his private advantage. The truth is, he was a helpleſs man, as to worldly affairs; and his tenants and relations impoſed upon him, cozened him of the profits of his parſonage, and kept him ſo indigent, that he wanted neceſſaries, even ink and paper, to his dying day. He was for ſome time confined to the King's-bench priſon for debt; but, in March 1682, was invited by Dr Whitler to live in the college of phyſicians. Here he continued till June following; when he was obliged, by his ill ſtate of health, to remove to the houſe of a grandchild of his in St Margaret's church-yard, Weſtminſter. But he died at the houſe of Mr Cothorne, reader of the church of St Giles's in the Fields, December the 12th, 1685, in the 74th year of his age, and was interred at the expenſe of Dr Buſby, maſter of Weſtminſter ſchool, and Mr Sharp, rector of St Giles's, in the rector's vault under that church.—Dr Pell publiſhed ſome other things not yet mentioned; a liſt of which is as follows, *viz.*

1. An Exercitation concerning Eaſter; 1644, in 4to. 2. A Table of 10,000 ſquare numbers, &c.; 1672, folio. 3. An Inaugural Oration at his entering upon the Profeſſorſhip at Breda. 4. He made great alterations and additions to Rhonius's Algebra, printed at London 1668, 4to, under the title of an Introduction to Algebra, tranſlated out of the High Dutch into Engliſh by Thomas Branker, much altered and augmented by D. P. (Dr Pell). Alſo a Table of Odd Numbers, leſs than 100,000, ſhewing thoſe that are incompoſite, &c. ſupputated by the ſame Thomas Branker. 5. His Controverſy with Longomontanus concerning the Quadrature of the Circle; Amſterdam, 1646, 4to.

He likewiſe wrote a Demonſtration of the 2d and 10th books of Euclid; which piece was in MS. in the library of Lord Brereton in Cheſhire: as alſo Archimedes's Arenarius, and the greateſt part of Diophantus's ſix books of Arithmetic; of which author he was preparing, Auguſt 1644, a new edition, in which he intended to correct the tranſlation, and make new illuſtrations. He deſigned likewiſe to publiſh an edition of Apollonius; but laid it aſide, in May 1645, at the deſire of Golius, who was engaged in an edition of that author from an Arabic manuſcript, given him at Aleppo 18 years before. Letters of Dr Pell to Sir Charles Cavendiſh, in the Royal Society.

Some of his manuſcripts he left at Brereton in Cheſhire, where he reſided ſome years, being the ſeat of William Lord Brereton, who had been his pupil at Breda. A great many others came into the hands of Dr Buſby; which Mr Hook was deſired to uſe his endeavours to obtain for the Society. But they continued buried under duſt, and mixed with the papers and pamphlets of Dr Buſby, in four large boxes, till 1755; when Dr Birch, ſecretary to the Royal Society, procured them for that body, from the truſtees of Dr Buſby. The collection contains, not only Pell's mathematical papers, letters to him, and copies of thoſe from him, &c. but alſo ſeveral manuſcripts of Walter Warner, the mathematician and philoſopher, who lived in the reigns of James I. and Charles I.

Dr Pell invented the method of ranging the ſeveral ſteps of an algebraical calculus, in a proper order, in ſo many diſtinct lines, with the number affixed to each ſtep, and a ſhort deſcription of the operation or proceſs in the line. He alſo invented the character ÷ for diviſion, @ for involution, ɯ for evolution.*

PELLETIER (Bertrand), was born at Bayonne in 1761, and very ſoon began to diſplay an inſatiable thirſt of ſcience. It frequently happens, however, that young men, ſincerely deſirous of inſtruction, have no means or place where they can be aſſiſted in the developement of their natural talents, no maſter who may point out the direct road to ſcience, and that order and method, without which the efforts of the individual too often lead him from the object of his purſuit, inſtead of bringing him nearer to it. This was not the caſe with young Pelletier. He found every advantange in his father's houſe, where he received the firſt elements of the art of which he was afterwards the ornament; and his ſubſequent progreſs was made under Darcet, who having

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* *Hutton's Mathematical Dictionary.*

Pelletier.

ving remarked in him that ſagacity which may be called the inſtinct of ſcience, admitted him among the pupils attached to the chemical laboratory of the college of France. Five years of conſtant application and ſtudy under ſuch a maſter, who was himſelf formed by nature, perfected by experience, and affectionately diſpoſed towards his pupil, afforded this young man a ſtock of knowledge very unuſual at his age. He ſoon gave a convincing proof of this, by publiſhing, at the age of 21, a ſet of very excellent obſervations on the arſenical acid. Macquer, by mixing nitre with the oxyd of arſenic, had diſcovered in the reſidue of this operation a ſalt ſoluble in water, ſuſceptible of cryſtallization in tetrahedral priſms, which he denominated the neutral arſenical ſalt. It is the arſeniat of potaſh. He was of opinion that no acid could decompoſe it; but Pelletier ſhewed, that the ſulphuric acid diſtilled from it does diſengage the acid of arſenic. He ſhewed the true cauſe why the neutral arſenical ſalt is not decompoſable in cloſed veſſels; and particularly the order of affinity by which the ſalt itſelf is formed in the diſtillation of the nitrate of potaſh, and the white oxyd of arſenic. He explains in what reſpects this ſalt differs from what Macquer called the liver of arſenic. Pelletier had been anticipated in this work by Scheele, by Bergman, by the academicians of Dijon, and by Berthollet; but he poſſeſſed at leaſt the merit, in the firſt eſſay of his powers, of having clearly developed all the phenomena of this operation, by retaining and even determining the quantity of gas it was capable of affording. After the ſame principles it was that he decompoſed the arſenico-ammoniacal ſalt, by ſhewing how, in the decompoſition of this laſt, the pure arſenical acid is obtained in the form of a deliqueſcent glaſs. In this work we may obſerve the ſagacity with which he was enabled to develope all the phenomena of theſe compoſitions and decompoſitions, by tracing thoſe delicate threads of ſcientific relation which connect the ſeries of facts, and are imperceptible to ordinary minds.

Encouraged by the ſucceſs of theſe firſt works, which he preſented with the ſenſibility of grateful attachment to his inſtructor, he communicated his obſervations on the cryſtallization of ſulphur, cinnabar, and the deliqueſcent ſalts; the examination of zeolites, particularly the falſe zeolite of Fribourg in Briſgaw, which he found to be merely an ore of zinc; obſervations on the dephlogiſticated or oxygenated muriatic acid, relative to the abſorption of oxygen; on the formation of ethers, particularly the muriatic and the acetous; and ſeveral memoirs on the operation of phoſphorus made in the large way; its converſion into phoſphoric acid, and its combination with ſulphur and moſt metallic ſubſtances.

It was by his operations on that moſt aſtoniſhing production of chemiſtry, phoſphorus, that he burned himſelf ſo dangerouſly as nearly to have loſt his life. After the cure of his wound, which confined him to his bed for ſix months, he immediately began the analyſis of the various plumbagos of France, England, Germany, Spain, and America, and found means to give novelty and intereſt to his work, even after the publication of Scheele on the ſame object. The analyſis of the carbonat of barytes led him to make experiments on animals; which prove that this earth is a true poiſon, whether it be adminiſtered in the form of the native carbonat of barytes, or whether it be taken from the decompoſition of the ſulphat, even though again combined with another acid.

Pelletier,
||
Pemigewaſſet.

Chemiſts have given the name of *ſtrontian* to a newly diſcovered earth, from the name of the place where it was firſt found. Pelletier analyſed it, and diſcovered it in the ſulphat of barytes. He likewiſe analyſed the verditer of England, of which painters and paper-hangers make ſo much uſe. He diſcovered a proceſs for preparing it in the large way, by treating with lime the precipitate obtained from the decompoſition of nitrat of copper by lime. By this proceſs, verditer is afforded equal in beauty to that which comes from England. He was likewiſe one of the firſt chemiſts who ſhewed the poſſibility of refining bell metal, and ſeparating the tin. His firſt experiments were made at Paris; after which he repaired to the foundry at Romilly, to verify them in the large way. The following year he was received a member of the Academy of Sciences at Paris, and ſhortly afterwards went to La Fere, with Borda and General Daboville, to aſſiſt in experiments upon a new gunpowder. Being obliged, in order to render his experiments more deciſive, to paſs great part of the day in the open air during a cold and humid ſeaſon, his health, which was naturally delicate, became conſiderably impaired. He began to recover his health, when he again became the victim of his zeal for the ſcience he ſo ſucceſsfully cultivated. He had nearly periſhed by reſpiring the oxygenated muriatic acid gas. A violent attack of convulſive aſthma, which returned during ſeveral days, was the firſt conſequence of this unhappy accident. The diſorder then ſeemed to abate; but it was incurable. The aſſiſtance of art was inſufficient to ſave him; and he died in Paris, on the 21ſt of July 1797, of a pulmonary conſumption, in the flower of his age.

PEMAQUID, a bay on the ſea-coaſt of Lincoln county, Diſtrict of Maine. It lies eaſt of Sheepſcot river, and contains a number of iſlands, many of which are under cultivation.—*Morſe.*

Pemaquid *Point*, on the weſt ſide of the above bay, lies 2 miles eaſt of Booth Bay, and about 4 leagues northweſt of Menhegan Iſland. N. lat. 44 5, W. long. 69.—*ib.*

PEMAGON, a ſettlement of the Diſtrict of Maine, 7 miles from Denney's river, and 14 from Mooſe Iſland. —*ib.*

PEMBROKE, a townſhip of Maſſachuſetts, in Plymouth county, 31 miles ſouth by eaſt of Boſton. It was incorporated in 1712, and contains 1954 inhabitants. It lies 18 miles from the mouth of North river; and veſſels of 300 tons have been built here.—*ib.*

Pembroke, the *Suncook* of the Indians, a townſhip of New-Hampſhire, in Rockingham county, on the eaſt ſide of Merrimack river, oppoſite to Concord. It lies upon two ſmall rivers, Bowcook and Suncook, which run a ſouth-by-weſt courſe into Merrimack river. In 1728, it was ſettled and called *Lovewell's Town.* It was incorporated in 1759, and contains 956 inhabitants.—*ib.*

PEMIGEWASSET, a river of New-Hampſhire, which ſprings from the eaſtern part of the ridge called the Height of Land. Mooſe-Hillock Mountain gives it one branch; another comes from the S. W. extremity of the White Mountains, and a third comes from the townſhip of Franconia. Its length is about 50 miles; its courſe generally S. and it receives from both ſides a number of ſtreams. Winipiſeogee river, comes from the lake of that name, and unites its waters with the Pemigewaſſet at the lower end of Sanborntown. From this junction, the confluent ſtream bears the name of Merrimack to the ſea.—*ib.*

PENDLETON, a county of Virginia, bounded north-weſt by Randolph, and ſouth by Rockingham counties; watered by the ſouth branch of the Patowmack. It contains 2,452 inhabitants, including 73 ſlaves. Chief-town, Frankford.—*ib.*

PENDLETON, a county of Waſhington diſtrict, S. Carolina, on Keowee and Savannah rivers. It contained, in 1795, 9,568 inhabitants, of whom 834 are ſlaves; and ſends three repreſentatives and 1 ſenator to the State legiſlature. The court-houſe in this county is 33 miles N. N. E. of Franklin court-houſe in Georgia, and 52 weſtward of Cambridge. A poſt-office is kept at this court-houſe.—*ib.*

PENDULUM (See *Encycl.*). Beſides the effects of heat and cold on the length of the pendulum rod, and of courſe on its iſochroniſm, it may certainly be worth while, in the conſtruction of clocks intended to meaſure time with the utmoſt poſſible exactneſs, to take into conſideration the reſiſtance of the air, which, by its unequal denſity, varying the weight of the pendulum, muſt in a ſmall degree accelerate or retard its motion. The celebrated David Rittenhouſe, who paid particular attention to this ſubject, eſtimates the extreme difference of velocity, ariſing from this cauſe, at half a ſecond a day; and he obſerves, that a remedy dependent on the barometer will not be ſtrictly accurate, as the weight of the entire column of air does not preciſely correſpond with the denſity of its baſe. He propoſes, therefore, as a very ſimple and eaſy remedy, that the pendulum ſhall, as uſual, conſiſt of an inflexible rod carrying the ball beneath, and continued above the centre of ſuſpenſion to an equal (or an unequal) diſtance upwards. At this extremity is to be fixed another ball of the ſame dimenſions (or greater or leſs, according as the continuation is ſhorter or longer), but made as light as poſſible. The oſcillations of this upper ball will be accelerated by its buoyancy by the ſame quantity as thoſe of the lower would be retarded; and thus, by a proper adjuſtment, the two effects might be made to balance and correct each other.

Our author made a compound pendulum on theſe principles, of about one foot in its whole length. This pendulum, on many trials, made in the air 57 vibrations in a minute. On immerſing the whole in water, it made 59 vibrations in the ſame time; ſhewing evidently, that its returns were quicker in ſo denſe a medium as water than in the air. (This is contrary to what takes place with the common pendulum). When the lower bob or pendulum only was plunged in water, it made no more than 44 vibrations in a minute.

PENGUIN, an iſland in the Atlantic Ocean, about 10 miles N. E. of the coaſt of Newfoundland. It has this name from the multitude of birds of that name which frequent it. N. lat. 50 5, W. long. 50 30. There is alſo an iſland of the ſame name, on the coaſt of Patagonia, in the S. Atlantic Ocean, 3 leagues ſouth-eaſt of Port Deſire. It is an uninhabited rock, high at the ends and low in the middle, and is the largeſt and outermoſt of a number of ſmall iſles or rocks, and is about a muſket-ſhot from the main land. It abounds in an extraordinary manner, with penguins and ſeals. It is three-fourths of a mile in length, and half a mile in breadth from E. to W.—*Morſe.*

PENNANT (Thomas, Eſq.), ſo well known in the republic of letters as a writer of travels, and of natural hiſtory, was an ancient Briton by birth, having drawn his firſt breath in Flintſhire, in 1726. His family has been ſettled in that county for many centuries; we learn from himſelf that he received the rudiments of his education at Wrexham, whence he was removed to Fulham. Soon after this he was ſent to Oxford; and having made a conſiderable proficiency in the claſſics, he applied himſelf within the walls of that univerſity to attain a knowledge of juriſprudence; but we do not find that he ever entered himſelf of any of the inns of court, or followed the law as a profeſſion.

The ruling paſſions of mankind are excited, and the future current of their lives frequently directed, by trivial circumſtances. One of the greateſt painters of our age was attracted with an irreſiſtible impulſe towards his art by the peruſal of a treatiſe on it; and we have the authority of the ſubject of this memoir for aſſerting, that a preſent of Willoughby's Ornithology, at an early period, firſt gave him a turn for natural hiſtory, which has never once abandoned him through the courſe of a very long life.

Mr Pennant commenced his travels with great propriety at home, where he made himſelf acquainted with the manners, productions, and curioſities, of his native country, before he ſallied forth to inſpect thoſe of other nations. He then repaired to the continent; and not only acquired conſiderable additional knowledge relative to his favourite ſtudies, but became acquainted, and eſtabliſhed a correſpondence, with ſome of the greateſt men of the age.

On his return he married, and had two children, but did not come into the family fortune until he was thirty-ſeven years of age, at which time he was ſettled at Downing.

Having loſt his wife, he appears to have ſet out once more for the continent, and to have formed an acquaintance with Voltaire, Buffon, Haller, Pallas, &c. He had by this time acquired conſiderable reputation as a ſcientific man, having commenced his career as an author ſo early as 1750. His Britiſh Zoology* eſtabliſhed his reputation as a naturaliſt; and this received a freſh acceſſion of celebrity in conſequence of his acquaintance with Linnæus, and his intercourſe by letters with all the celebrated naturaliſts in Europe.

Early in life he had undertaken a moſt intereſting tour to Cornwall; and he now entertained an ardent deſire to ſurvey the works of nature in the northern extremities of the iſland. He accordingly ſet out for Scotland, and in 1771 favoured the public with an entertaining account of his Tour†, which was ſo well received as to paſs through ſeveral editions. Not content with the main land of Great Britain, he was ambitious to ſurvey the iſlands in the vicinity, and accordingly penetrated to the Hebrides, and viſited Man.

It is not to be ſuppoſed that he would leave his own country unexplored; on the contrary, he minutely deſcribed all its wonders. He did not fail on this occaſion to preſent the world with the reſult of his enquiries, for in 1778 he commenced the publication of his Welch Tour.§

In four years after this (1782) appeared the account of the Journey from Cheſter to London‡, in which he refutes the vulgar opinion that it is unintereſting; and in two years more his Arctic Zoology, an admirable work, greatly prized both here and in other countries.

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* Four vols. 4to.

† Three vols. 4to.

§ Two vols 4to.

In 1790 appeared a quarto volume, ſimply entitled Of London; in which he obſerves that this work is compoſed from obſervations, originally made without any view of publication. "Let me requeſt (ſays he in the preface) the good inhabitants of London and Weſtminſter not to be offended at my having ſtuffed their Iliad into a nutſhell; the account of the city of London and liberties of Weſtminſter into a quarto volume. I have condenſed into it all I could; omitted nothing that ſuggeſted itſelf; nor amplified any thing to make it a guinea book. In a word, it is done in my own manner, from which I am grown too old to depart.

"I feel within myſelf a certain monitor that warns me (adds he) to hang up my pen in time, before its powers are weakened, and rendered viſibly impaired. I wait not for the admonition of friends. I have the Archbiſhop of Grenada in my eye; and fear the imbecility of human nature might produce in long-worn age the ſame treatment of my kind adviſers as poor Gil Blas had from his moſt reverend patron. My literary bequeſts to future times, and more ſerious concerns, muſt occupy the remnant of my days. This cloſes my public labours."

Notwithſtanding his parting addreſs, the example of the Archbiſhop of Grenada, and the concluding ſentence of "*Valete & Plaudite*," we find Mr Pennant adventuring once more in the ocean of literature, at a late period of his life, and trying his fortune again with all the eagerneſs of a young author.

He accordingly publiſhed the Natural Hiſtory of the pariſhes of Holywell and Downing,* within the precincts of the latter of which he had reſided about half a century.

He alſo preſented the public, a very ſhort time before his death, with a ſplendid work, conſiſting of 2 vols. 4to. entitled The View of Hindooſtan; in the preface to which he candidly ſtates his motives for this new attempt. "I had many ſolicitations from private friends (ſays he), and a few wiſhes from perſons unknown, delivered in the public prints, to commit to the preſs a part, in the form in which the poſthumous volumes might hereafter make their appearance. I might have pleaded the imprudence of the attempt at my time of life, of beginning ſo arduous an undertaking in my 71ſt year.

"I happily, till very lately, had ſcarcely any admonition of the advanced ſeaſon. I plunged into the ſea of trouble, and with my papers in one hand, made my way through the waves with the other, and brought them ſecure to land. This, alas! is finite boaſting. I muſt ſubmit to the judgment of the public, and learn from thence how far I am to be cenſured for ſo grievous an offence againſt the maxim of Ariſtotle, who fixes the decline of human abilities to the 49th year.

"I ought to ſhudder, when I conſider the wear and tear of 22 years; and feel ſhocked at the remark of the elegant Delanty, who obſerves, 'that it is generally agreed among wiſe men, that few attempts, at leaſt in a learned way, have ever been wiſely undertaken and happily executed after that period!'

"I cannot defend the wiſdom: yet from the good fortune of my life I will attempt the execution."

Theſe valuable volumes are drawn up by Mr Pennant in the manner of his introduction to the Arctic Zoology. The plates, 23 in number, are admirably engraved, and one (the Napaul pheaſant) is beautifully coloured.

In addition to the liſt of literary labours already enumerated, is a letter on an earthquake felt at Downing, in Flintſhire, in 1753; another inſerted in the ſame publication,* in 1756, on coralloid bodies (κοραλλοειδης) collected by him: his Synopſis of Quadrupeds, publiſhed in 1771; a pamphlet on the Militia; a paper on the Turkey; and a volume of Miſcellanies.

Mr Pennant attained academical honours of all kinds, having had the degree of LL. D. conferred on him by the univerſity in which he was educated, he was a Fellow of the Royal Society, and a member of the Society of Antiquaries, a Fellow of the Royal Society of Upſal in Sweden, a member of the American Philoſophical Society, an honorary member of the Anglo-Linnæan Society, &c.

The ample fortune left him by his father enabled Mr Pennant to keep an hoſpitable table, and alſo to preſent the profits of ſeveral of his works to public inſtitutions, particularly the Welſh charity-ſchool in Gray's-inn-lane. He encouraged ſeveral engravers by his patronage, and was not a little ſerviceable to the advancement of the fine arts.

In 1776 he married a ſecond time; on which occaſion he became united to Miſs Moſtyn, ſiſter of his neighbour, the late Sir Roger Moſtyn, in Flintſhire. The latter part of his life was chearful, and he ſcarcely felt the approaches of old age. He died at his ſeat at Downing in his 72d year.

He has left ſeveral works behind him in MS. under the title of Outlines of the Globe; and as a proof that it will be a very voluminous and intereſting publication, it is only neceſſary to obſerve, that The View of Hindooſtan compoſed the xivth and xvth volumes.

Mr Pennant poſſeſſed a well-compacted frame of body, an open and intelligent aſpect, an active and chearful diſpoſition, and a vivacity which rendered him always entertaining, as well in converſation as in writing. Though not without a ſhare of irraſcibility, his heart was kind and benevolent. He was exemplary in the relations of domeſtic life, and ſenſibly felt for the diſtreſſes of his poor neighbours, whoſe relief in ſeaſons of hardſhip he promoted with great zeal and liberality. His candour and freedom from ordinary prejudices, are ſufficiently diſplayed in his writings; and Scotland was forward to confeſs, that he was the firſt traveller from the ſouth ſide the Tweed, who had viſited the country with no unfriendly ſpirit, and had fairly preſented it under its favourable as well as its leſs pleaſing aſpects. As a writer, his ſtyle is lively and expreſſive, but not perfectly correct. His principles of arrangement in zoology are judicious, and his deſcriptions characteriſtic. If in ſome of his later works a little vanity appears, and a propenſity to think that important to the world which was ſo to himſelf, it may readily be pardoned to one who has afforded ſuch copious and valuable entertainment to the public. His name will live with honour in the literary hiſtory of his country, and his memory will be cheriſhed with reſpect and affection by his ſurviving friends.

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‡ One vol. 4to.

* One vol. 4to.

* *Phil. Tranſ.*

Plate XLI.

PENNATULA (See *Encycl.*). A ſpecies of this animal, hitherto undeſcribed, was diſcovered by La Martiniere near Nootka. Its body is of a cartilaginous ſubſtance, and a cylindrical form; its head, armed with two little horns of the ſame ſubſtance, preſents a ſpherical figure flatted at its anterior extremity. This part is covered with ſmall papillæ, ſome of which are viſible at D, and which ſerve the purpoſe of ſmall mouths, by means of which this animal ſucks the blood of fiſhes, making its way as far as poſſible into the fleſh: the extremity of its body, which always projects from the fiſh, appears like the feathers of a pen; theſe feather-like ſubſtances ſerve as excretory veſſels; for on making a ſlight preſſure on the animal, from the greater part of theſe cartilaginous barbs iſſued ſmall drops of a very limpid liquor: at the baſe of theſe barbs, and beneath the body, are placed two large cartilaginous threads, of which our author could not imagine the uſe, for they are not univerſally met with in each individual. The circulation of its blood is readily obſerved, it forms a complete revolution about once in a minute. It is probable that this animal is only able to make its way into the bodies of different fiſh when it is very young; and when it has once buried itſelf there, having abundance of nouriſhment, its head increaſes conſiderably, and the two horns with which it is furniſhed neceſſarily form an obſtacle to its regreſs, which is a remarkable inſtance of the foreſight of Nature, ſince it is deſtined to be nouriſhed at the expenſe of another. The pennatula, of which we have given from Martiniere a figure, was found by him at the depth of more than an inch and an half in the body of a *diodon*.

PENN, *Fort*, ſtands at the mouth of a ſmall creek, on the weſt ſide of Delaware river, in Northampton county, about 21 miles north of the town of Eaſton, and near 70 north of Philadelphia. N. lat. 40 59, W. long. 75 13. The road from Philadelphia to Tioga Point, paſſes through the opening in the Blue Mountains, called *Wind Gap*, about 9 miles ſouth-weſt of this fort.—*Morse.*

Penn, *Port*, in New-Caſtle county, Delaware, is ſituated on the W. bank of Delaware river, oppoſite to Reedy Iſland.—*ib.*

PENNINGTON, or *Pennytown*, a pleaſant and flouriſhing village in Hunterdon county, New-Jerſey, 9 miles W. of Princeton, and 36 N. E. by N. of Philadelphia. It contains a church for public worſhip, and about 40 houſes.—*ib.*

PENN'S *Rocks*, two cluſters of iſlands in the broadeſt and ſouth-weſt part of Hudſon's Bay, N. America; diſtinguiſhed by the names of E. and W. Penn's.—*ib.*

Penn's, a townſhip of Pennſylvania, on Suſquehannah river.—*ib.*

Penn's *Neck*, in Salem county, New-Jerſey, lies on Old Man's Creek, which is part of the boundary between Salem and Glouceſter counties. It is 12 miles N. E. by N. of Salem, 3½ miles from the Delaware, and 5 below Swedeſborough.—*ib.*

Penn's *Neck*, the name of a range of farms of excellent ſoil, ſituated about a mile and a half ſouth eaſt of Princeton in New-Jerſey, on a point of land formed by Mill ſtone river and Stony brook. It derived its name from the celebrated legiſlator, William Penn, who formerly owned this tract.—*ib.*

PENNSBOROUGH, *Eaſt* and *Weſt*, two townſhips in Cumberland county, Pennſylvania. There is alſo a townſhip of this name in Cheſter county, Pennſylvania. —*ib.*

PENNSBURY, a ſmall town of Pennſylvania, in Buck's county on a ſmall creek of Delaware river. It was a manor which the celebrated Mr Penn reſerved for himſelf. Here he built a houſe, and planted gardens and orchards; which, with many additional buildings and improvements, ſtill continue.—*ib.*

PENOBSCOT, a bay on the coaſt of Hancock county, Diſtrict of Maine, and called *Norombega* by the firſt diſcoverer, is about 16 leagues wide from Naſkeag Point and Burnt Coat Iſland, on the E. to the point on which Thomaſtown ſtands, on the weſt ſide of the bay. The chief iſlands it encloſes are Fox, Haut, Long and Deer Iſlands; beſides a number of ſmall iſles, rocks and ledges. Through this bay to the mouth of the river of its name, the weſtern channel goes up by a head-land on the W. called Owl's Head, and between Long Iſland on the W. and Cape Roſier on the E. to Bagaduce Point. The eaſtern channel is between Haut Iſland on the weſt, and Burnt Coat Iſland on the eaſt, and through a reach, called Long Reach, formed by the ſhores of Naſkeag, or Sedgwick, on the E. or N. E. and Deer Iſlands on the W. or S. W. till it unites with the other channel, between Point Roſier and Long Iſland. On a fine peninſula on the eaſt ſide of the bay, the Britiſh built a fort and made a ſettlement, which is now the ſhire-town of the county of Hancock, and is a commodious place for the lumber trade. Haut Iſland, or Iſle of Holt, lies in lat. 44 23 N. and long. 68 10 W. and is the ſouthernmoſt of the large iſles.—*ib.*

Penobscot, the noble river which empties its waters into the above deſcribed bay, is the moſt conſiderable in the Diſtrict of Maine, and riſes by two branches in the high lands. Between the ſource of the weſt fork, and its junction with the eaſt, is Mooſehead Lake, 30 or 40 miles long, and 15 wide. The eaſtern branch paſſes through ſeveral ſmaller lakes. From the forks, as they are called, the Penobſcot Indians paſs to Canada, up either branch, principally the weſt, the ſource of which, they ſay, is not more than 20 miles from the waters which empty into the St Lawrence. At the forks is a remarkable high mountain. From thence down to Indian Old Town, ſituated on an iſland in this river, is about 60 miles, 40 of which, the water flows in a ſtill ſmooth ſtream, and in the whole diſtance there are no falls to interrupt the paſſage of boats. In this diſtance the river widens and embraces a great number of iſlands. About 60 rods below Indian Old Town are the Great Falls, where is a carrying-place of about 20 rods; thence 12 miles to the head of the tide there are no falls to obſtruct boats. Veſſels of 30 tons come within a mile of the head of the tide. Thence 35 miles to the head of the bay, to the ſcite of Old Fort Pownal, the river flows in a pretty ſtraight courſe, and is eaſily navigated. Paſſing by Majabagaduſe on the eaſt 7 miles, and Owl's-Head 20 miles further, on the weſt, you enter the ocean. It is high water here, at full and change, 45 minutes paſt 10. At the entrance of the river is 10 fathoms water. The Indians have a communication from this river to Scoodick river by a portage of 3 miles. This river was the weſtern limits of Nova-Scotia or Acadia, by the treaty of Utrecht.—*ib.*

PENOBSCOTS, a ſmall tribe of Indians who live in Indian Old Town, on an iſland in Penobſcot river. They aver that they have poſſeſſed the iſland, on which their town ſtands, 500 years. It ſtands juſt above the Great Falls, and conſiſts of about 200 acres of land. In a former war, this tribe loſt their lands; but at the commencement of the laſt war, the Provincial Congreſs forbade any perſon ſettling on the lands from the head of the tide on Penobſcot river, included in lines drawn ſix miles from the river on each ſide; that is, a tract 12 miles wide, interſected by the middle of the river. They, however, conſider that they have a right to hunt and fiſh as far as the mouth of the Bay of Penobſcot extends. This was their original right, in oppoſition to any other tribe, and they now occupy it.—*ib.*

PENSACOLA *Harbour* and *Town*. The harbour is on the N. ſhore of the Gulf of Mexico, 11 leagues eaſt of Port Lewis, and Mobile, and 158 W. of the iſlands of Tortuga. It is large, ſafe from all winds, and has 4 fathoms water at its entrance, deepening gradually to 7 or 8. The bar lies in lat. 30 15 N. and long. 87 14 W. The town of Penſacola, the capital of Weſt-Florida, lies along the beach of the bay, is of an oblong form; about a mile in length, and a quarter of a mile in breadth. It contains ſeveral hundred habitations; and many of the public buildings and houſes are ſpacious and elegant. The governor's palace is a large ſtone building, ornamented with a tower, built by the Spaniards. It is defended by a ſmall fort called St Mary de Galve. The exports from this town, conſiſting of ſkins, logwood, dying-ſtuff and ſilver dollars, amounted, while in the poſſeſſion of the Britiſh, to £63,000 annually. The average value of imports, for 3 years, from Great Britain, was £97,000. The town and fort of Penſacola ſurrendered to the arms of Spain, in the year 1781, and with them the whole province. Eſcambia river, or Shambe, is the largeſt ſtream which falls into Penſacola Bay. It admits ſhallops ſome miles up, and boats upwards of 50 miles. —*ib.*

PENTECOST, an iſland in the *Archipelago of the Great Cyclades*. It was diſcovered by Bouganville, May 22, 1768, and named from the day, being the day of Pentecoſt. It is two leagues diſtant from Aurora Iſland, which is in 15 8 S. lat. and 165 58 E. long. from Paris.—*ib.*

PENUCO, a province of Mexico, ſeparated from that of Angelos, or Tlaſcala, on the N. by Tuſpa river.—*ib.*

PEPCHIDIACHICH, a point or head land on the S. ſhore of the Great Bay of Chaleurs, near the N. E. extremity of the province of New-Brunſwick. It is alſo called Pepchidichi, and lies W. S. W. of Port David. —*ib.*

PEPIN, a lake, or rather a dilatation of the river Miſſiſſippi, where it receives the river Chippeway from the N. E. in lat. 44 5 N. and long. 93 42 W. below the Falls of St Anthony.—*ib.*

PEPPERELL, a townſhip of Maſſachuſetts, on the E. branch of Naſhaway river, and on the N. line of Middleſex county. It joins Groton on the ſouth-eaſtward, and is 40 miles N. by W. of Boſton. It was incorporated in 1753, and contains 1132 inhabitants.—*ib.*

PEPPERELBOROUGH, a townſhip in York county, Diſtrict of Maine, on the N. E. ſide of Saco river, near the mouth, and which ſeparates it from Biddeford to the ſouthward. It is about 12 miles S. W. of Portland, and 109 N. of Boſton. It was incorporated in 1772, and contains 1,352 inhabitants.—*ib.*

PEPUSCH (John Chriſtopher), one of the greateſt theoretic muſicians of modern times, as we are told, was born at Berlin about 1667; and became ſo early a proficient on the harpſichord, that at the age of 14 he was ſent for to court, and appointed to teach the prince, father of the late King of Pruſſia. About 1700, he came over to England, and was retained as a performer at Drury Lane: it is ſuppoſed that he aſſiſted in compoſing the operas which were performed there. While he was thus employed, he forebore not to proſecute his private ſtudies; and theſe led him to enquire into the muſic of the ancients, and the peruſal of the Greek authors upon that ſubject. The abilities of Pepuſch, as a practical compoſer, were not likely to become a ſource of wealth to him: his muſic was correct, but it wanted variety of modulation. Beſides, Handel had got poſſeſſion of the public ear, in the opinion of whoſe ſuperior merit he readily acquieſced; and choſe a track for himſelf, in which he was almoſt ſure to meet with no obſtruction. He became a teacher of muſic, not the practice of any particular inſtrument, but muſic in the abſolute ſenſe of the word, that is to ſay, the principles of harmony and the ſcience of practical compoſition; and this, not to children or novices, but in very many inſtances to profeſſors of muſic themſelves.

In 1713, he was admitted to the degree of Doctor in Muſic at Oxford, and continued to proſecute his ſtudies with great aſſiduity. In 1724, he accepted an offer from Dr Berkeley to accompany him to the Bermudas, and to ſettle as profeſſor of muſic in his intended college there; but the ſhip in which they ſailed being wrecked, he returned to London, and married Franceſca Margarita de l'Epine. This perſon was a native of Tuſcany, and a celebrated ſinger, who performed in ſome of the firſt of the Italian operas that were repreſented in England. She came hither with one Greber, a German, and from this connection became diſtinguiſhed by the invidious appellation of *Greber's Peg*. Afterwards ſhe commenced a new connection with Daniel Earl of Nottingham, who had defended the orthodox notion of the Trinity againſt the heretic Whiſton; and to this connection Rowe, in imitation of Horace's, " Ne ſit ancillæ tibi amor pudori," thus alludes:

> Did not baſe Greber's Peg inflame
> The ſober earl of Nottingham,
> Of ſober ſire deſcended?
> That, careleſs of his ſoul and fame,
> To play-houſes he nightly came
> And left church undefended.

She continued to ſing on the ſtage till about 1718; when having, at a modeſt computation, acquired above ten thouſand guineas, ſhe retired from the theatre, and afterwards married Dr Pepuſch. She was remarkably tall, and remarkably ſwarthy; and, in general, ſo deſtitute of perſonal charms, that Pepuſch ſeldom called her by any other name than Hecate, to which ſhe is ſaid to have anſwered very readily.

The change in Pepuſch's circumſtances by Margarita's fortune was no interruption to his ſtudies: he loved muſic, and he purſued the knowledge of it with ardour. At the inſtance of Gay and Rich, he undertook to compoſe, or rather to correct, the muſic for the Beggar's Opera. His reputation was now at a great height. He had peruſed with great attention thoſe ſeveral ancient treatiſes on Harmonics, publiſhed by Meibomius, and that of Ptolemy by Dr Wallis; and the difficulties which occurred to him on the peruſal, were in a great meaſure removed by his friend De Moivre the mathematician, who aſſiſted him in making calculations for demonſtrating thoſe principles on which the harmonic ſcience is founded. In conſequence of theſe ſtudies, he was eſteemed, in matters of theory, one of the beſt muſicians of his time. In 1737, he was choſen organiſt of the Charter-houſe, and retired, with his wife, to that venerable manſion. The wife died in 1740, before which he loſt a ſon, his only child; ſo that he had no ſource of delight left, but the proſecution of his ſtudies, and the teaching of a few favourite pupils, who attended him at his apartments. Here he drew up that account of the ancient genera which was read before the Royal Society, and is publiſhed in the Philoſophical Tranſactions for October, November, and December, 1746; and, ſoon after the publication of that account, he was choſen a Fellow of the Royal Society.

He died the 20th of July, 1752, aged 85; and was buried in the chapel of the Charter-houſe, where a tablet with an inſcription is placed over him.*

PEPY'S *Iſlands*, the ſame with Falkland Iſlands. Pepy's Iſland, deſcribed in Commodore Anſon's Voyage, lies in lat. 47 S 8 leagues E. of Cape Blanco, on the coaſt of Patagonia, and was diſcovered by Capt. Cowley in 1680, who repreſents it to be commodious for taking in wood and water, and provided with a harbour capable of holding 1000 ſail of ſhips; abounding with fowls, and promiſing great plenty of fiſh.—*Morse.*

PEQUANACK, a townſhip of Morris county, New-Jerſey; perhaps the ſame as in ſome maps is called *Pegunnock*, which is ſeparated from Bergen county, northward by Pegunnock river.—*ib.*

PEQUANNOCK *Point* and *River*. The river is a ſmall ſtream which runs ſouthward through the towns of Huntington and Stratford in Fairfield county, Connecticut, and empties into a bay in the Sound where veſſels may anchor. The point forms the weſtern extremity of the bay near which are ſome rocks; from thence the outer bar extends N. by N. E. The point is 5 miles S. W. of Stratford river.—*ib.*

PERAMUS, or *Perames*, in Bergen county, New-Jerſey, lies on the point of land formed by the branches of Saddle river, a north water of Paſſaik; about 18 miles northward of Bergen, 10 weſt of Tappan, and 21 N. W. by N. of New-York city.—*ib.*

PERCEE, *l'iſle*, a ſmall but remarkable iſland on the weſt ſide of the Gulf of St Lawrence, being a perpendicular rock, pierced with two natural arches, through which the ſea flows. One of theſe arches is ſufficiently high to admit a large boat to paſs freely through it. It is 15 miles ſouth of Cape Gaſpee. It is aſſerted that it was formerly joined to Mount Joli, which lies oppoſite to it on the continent.—*ib.*

PERCIPANY, a village in Morris county, New-Jerſey, ſituated on a branch of Paſſaik river, and 6 miles N. of Morriſtown.—*ib.*

PERCUSSION, Force of Percussion, is the name by which mechanicians diſtinguiſh that faculty of producing motion, or making other ſenſible mechanical impreſſions on bodies, by means of the ſtroke of a body in motion. It is nearly the ſame with *impulſe*; only, it would ſeem that the very ſcrupulous and refined affect to limit the attention to the *immediate* cauſe of the motion, or other effect produced; to the ſomething that is different, both from the force ſuppoſed to be inherent in the moving body (a hammer for example), and the ſubſequent motion and penetration of the nail which is driven by it. We may venture to ſay that it is needleſs to attempt any inveſtigation of this object. It is hid, with all other cauſes of all other effects in the univerſe, in impenetrable darkneſs. If we reflect on the conſtitution of our own mind, ſo far as we can know it by experience and obſervation, and on the manner in which we draw concluſions, we muſt ſee that the knowledge of the efficient cauſe of any effect is unattainable; for were the intervening ſomething pointed out to us, and clearly conceived by us, we ſhould find it juſt as neceſſary to find out why and how this ſomething is connected with each of the events which we obſerve it invariably to connect.

But a knowledge of the force of percuſſion, in as far as it may or may not be diſtinguiſhable from other forces, is not unattainable. We can learn as much, and no more, concerning this, as concerning any other force: and we can contemplate that circumſtance which, in our opinion, is common to it with all other forces, and may perhaps diſcover other circumſtances in which it differs from them. But in all this diſquiſition, it is plain that it is only events, which we conceive to be the characteriſtic effects of the cauſe, that we contemplate.

Percuſſion, conſidered as an effect, characteriſtic of a particular faculty of moving bodies, became an object of anxious reſearch, almoſt as ſoon as philoſophers began to think of motion and moving forces at all. The ancients (as has been obſerved in the article Impulsion, *Suppl.*) contented themſelves with very vague ſpeculations on the ſubject. Galileo was the firſt who conſidered it as a meaſurable thing, the object of mathematical diſcuſſion; being encouraged by his precious diſcovery of the laws of accelerated motion, and the very refined meaſure which theſe gave him of the power of gravity. It was a meaſure of the heavineſs, not of the weight, of the body; and this was meaſured by its acceleration, and not by its preſſure. Encouraged by this, he hoped to find ſome ſuch meaſure of the force of percuſſion, which he ſaw ſo intimately connected with motion; whereas its connection with preſſure was far from being obvious. He therefore tried to convert the terms; and as he had found a meaſure of the preſſure of gravity in the acceleration of motion, he endeavoured to find in preſſure a meaſure of the force of percuſſion ariſing from this acceleration. He endeavoured to find the number of pounds, whoſe preſſure is equal to the blow of a given body, moving with a given velocity. The velocity was known to him with great preciſion, by means of the height from which the ball muſt fall in order to acquire it. It ſeems pretty clear that percuſſion may be meaſured in this way: for a body falling from a height will pierce an uniformly tenacious body to a certain degree, and no further; and experiment ſhews that this degree of penetration is very preciſe and conſtant. The ſame body, being merely laid on the tenacious body, will penetrate to a ſmall depth by its weight. Laying more weight on it, will make it penetrate deeper; and a certain weight will make it penetrate as deep as the fall did, and no deeper. Thus, percuſſion ſeems very eaſily meaſurable by weight, or by any preſſure ſimilar to that of weight. It appears that Galileo made experiments with this view, and that he was diſappointed, and obliged to acquieſce in the opinion of Ariſtotle, that percuſſion and weight are incomparable. He propoſes, therefore, another experiment, namely, to drop a body into the ſcale of a balance from greater and greater heights, till at laſt the blow on the ſcale raiſes a weight that lies in the other ſcale. This offers itſelf ſo plauſibly, that we are perſuaded that Galileo tried it: but as he makes no mention of the reſults, we preſume that they were unſatisfactory.

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* Biog. Dict. new edit.

Neither of theſe experiments *could* give us a meaſure of the force of percuſſion, if this force be any thing different from the forces which are excited or brought into action by percuſſion, in the manner deſcribed in the article Impulsion, *Suppl.* When the ball comes into phyſical contact with the ſcale, it begins to compreſs it. This compreſſion begins to ſtretch the ſtrings by which the ſcale is ſupported. Theſe pull at the arm of the balance, and cauſe it to preſs the centre-pin a little harder on its ſupport, and to bend the balance a little, and cauſe it to pull at the cords which ſupport the other ſcale. That ſcale is pulled upwards, diminiſhing a little its preſſure on the ground, and preſſing it harder to the incumbent weight. Theſe forces are excited *in ſucceſſion* from the one ſcale to the other, and a ſmall moment of time elapſes. The reaction of the ſcale diminiſhes, but does not inſtantaneouſly annihilate, the velocity of the falling ball. It therefore compreſſes the ſcale ſtill more, ſtretches the threads, preſſes the fulcrum, and bends the balance ſtill more (becauſe the weight in the other ſcale keeps it down). The velocity of the falling ball is rapidly diminiſhed; the balance is more bent, and pulls more ſtrongly upwards at the threads of the other ſcale; and thus preſſes that ſcale more ſtrongly againſt the incumbent weight, gradually communicating more and more motion to it, removing it farther from the ground, till, at laſt, the motion becomes ſenſible, or ſo conſiderable as to diſengage ſome delicate catch as a ſignal. The experiment is now finiſhed; and the mechanician fondly thinks that, at this inſtant, the preſſure excited by the percuſſion, between the oppoſite ſcale and the under ſide of the incumbent weight, is juſt equal, or but a very little ſuperior, to the preſſure of the incumbent weight: and, ſince the arms of the balance are equal, and therefore the preſſures on the two ſcales are equal, he imagines that that weight exerts a preſſure equal to the percuſſion of the falling ball.

But all this is miſconception, and alſo falſe reaſoning. It is not percuſſion that we are meaſuring, but the preſſures, excited by percuſſion, on the two ſcales. And theſe preſſures are the forces of elaſticity or expanſiveneſs, belonging to, or inherent in, the particles of the balls and the ſcales; forces which are brought into action by the approach of thoſe bodies to each other. This reaſoning is alſo erroneous; and we ſhould be miſtaken if we think that the preſſure actually exerted is equal to that of the weight in the oppoſite ſcale. It is greater than the mere preſſure of that weight. The reaction of the oppoſite ſcale on its load was preciſely equal to that weight before the ball was dropped from the hand; and, had the ball been equal to that weight, and ſimply laid into the ſcale on which it falls, it would have made no change on the mutual preſſures of the ſcale and the other weight; it would only have relieved the ground from the preſſure of that weight, and would have brought it on the threads which ſupport its ſcale. The preſſure of this ſcale upwards muſt be increaſed, before it can ſtart the weight ſenſibly from the ground. How much it muſt be increaſed depends on the ſpringineſs of the ſcales, cords, and beam. By a proper adjuſtment of theſe particulars, the apparatus will give us almoſt any meaſure of percuſſion that we chooſe. For this reaſon, the improvements made on it by Graveſande are of no value. The ſame reaſoning, nearly, may be applied to the meaſurements of the force of percuſſion by means of the penetration of ſoft bodies.

Galileo mentions another very curious experiment, by which he thought that he had obtained a juſt meaſure of percuſſion. A veſſel, filled with water, was ſuſpended on the arm of a balance, with another veſſel hanging from it, a great way below. All was exactly balanced by a weight in the oppoſite ſcale. By means of a ſuitable contrivance, a hole was opened in the bottom of the upper veſſel, without diſturbing the equilibrium. As ſoon as the water iſſued, and while it was falling through the air, that end of the balance roſe; but when the water ſtruck the lower veſſel, the equilibrium was reſtored, and continued during the whole time of the efflux. Hence Galileo concluded, that the force of the ſtroke was equal to the weight of the falling water. But we apprehend that the obſervations made on this in the article Impulsion, *Suppl.* will convince the reader that this concluſion is far from being legitimate. Beſides, the ſtroke, in any one inſtant, is made by thoſe particles only which ſtrike in that inſtant, while the whole vein of water between the veſſels is neither acting by its weight on the upper veſſel, nor by its ſtroke on the lower; and we ſhould conclude, from the experiment, that the force of percuſſion is infinitely greater than the weight of the ſtriking body. Indeed this is the inference made by Galileo. But if we have recourſe to the experiments and reaſonings of Daniel Bernoulli, in the article *Resistance of Fluids*, *Encycl.* we ſhall find that the ſeeming impulſe on the lower veſſel is really a moſt complicated pure preſſure, and of moſt uncertain determination. The experiment is valuable, and gives room for curious reflections. We have repeated it, in a great variety of forms, and with great changes of impulſe, and ſometimes in ſuch a manner that no impulſe whatever can obtain, while at the ſame time a quantity of water was falling, unſupported by either veſſel. In all the trials the equilibrium remained undiſturbed. We were obliged to conclude, therefore, that the experiment afforded no meaſure of percuſſion. Indeed we were of this opinion before making the trial, for the reaſons juſt now given.

We cannot ſay that the ſubſequent labours of philoſophers have added much to our knowledge of this matter. Mr Leibnitz had contrived his whimſical doctirne of *living* and *dead* forces. The action of gravity, or of a ſpring, is a *vis viva*, when it actually produced motion in the body on which it acts; but when a ſtone lies on a table, and preſſes on it, this preſſure is a *vis mortua*. Its exertion is made, and in the ſame inſtant deſtroyed, by an oppoſite *vis mortua*. Each of theſe exertions would have produced a *beginning* of motion (ſomething different from any the ſmalleſt local motion); and the ſum of all would, after a certain time, have amounted to a ſenſible motion and velocity. There ſeems no diſtinct conception to accompany, or that can accompany, this language. And as a proof that Leibnitz had no diſtinct conceptions of the matter, he has recourſe to this very experiment of Galileo in ſupport of his geneſis of a ſenſible motion from the continual exertions of the *vis mortua;* and he concludes that the force of percuſſion is infinitely, or incomparably, greater than preſſure, becauſe it is the ſum total of an infinity of individual exertions of *vis mortua*. Nothing but the authority which Leibnitz has acquired on the continent, by the zealous efforts of his partizans, could excuſe our taking up any time in conſidering this unintelligible diſcourſe. Surely, if there is ſuch a thing as a *vis viva*, it exiſts in the moving water, and its impulſions are not continual exertions of a *vis mortua*. Nor is it poſſible to conceive continual impulſe, nor a beginning of motion that is not motion, &c. &c. It is paradoxical (and Leibnitz loved to raiſe the wonder of his followers by paradoxes) to ſay that percuſſion is infinitely greater than preſſure, when we ſee that preſſure can do every thing that can be done by percuſſion. Nay, Euler, by far the moſt able ſupporter of the doctrines of Leibnitz about the force of bodies in motion, actually compares theſe two forces; and, in his commentary on Robins's Artillery, demonſtrates, in his way, that when a muſket ball, moving with the velocity of 1700 feet per ſecond, penetrates five inches into a block of elm, the force of its percuſſion is 107,760 times its weight. John Bernoulli reſtricts the infinite magnitude of percuſſion to the caſe of perfectly hard bodies; and, for this reaſon alone, ſays, that there can be none ſuch in the univerſe. But, as this juſtly celebrated mathematician ſcouts with ſcorn the notion of attractions and repulſions, he muſt allow, that an ultimate atom of matter is unchangeable in its form; which we take to be ſynonymous with ſaying that it is perfectly hard. What muſt be the reſult of one atom in motion hitting another at reſt? Here muſt be an inſtantaneous production of a finite velocity, and an infinite percuſſion. A doctrine which reduces its abettors to ſuch ſubterfuges, and engages the mind in ſuch puzzling contemplations, cannot (to ſay the beſt of it) be ſtiled an EXPLANATION of the laws of Nature. The whole language on the ſubject is full of paradoxes and obſcurities. In order to reconcile this infinite magnitude of percuſſion with the obſerved finite magnitude of its effects, they ſay that the preſſure, or inſtantaneous effort, has the ſame relation to the force of percuſſion that an element has to its integral; and in maintaining this aſſertion, they continually conſider this integral under the expreſs denomination of a *ſum total*, robbing Leibnitz's great diſcovery of the infiniteſimal calculus of every ſuperiority that it poſſeſſed over Wallis's Arithmetic of Infinites, and really employing all the erroneous practices of the method of indiviſibles. We look upon the ſtrange things which have been inculcated, with pertinacious zeal in this doctrine of percuſſion and *vires vivæ*, as the moſt remarkable example of the errors into which the unguarded uſe of Calvalerius's Indiviſibles, and of the Leibnitzian notion of the infiniteſimal calculus, have led eminent mathematicians. It is not true that the preſſure, and the ultimate force of percuſſion, have this relation; nor has the preſſure and the reſulting motion, which is miſtaken for the meaſure of this ultimate force, any mathematical relation whatever. The relation is purely phyſical; it is the relation of pure cauſe and effect; and all that we know of it is their conſtant conjunction. The relation of fluxion and fluent is not a mathematical or meaſurable relation, but a connection in thought; which is ſufficient for making the one an indication of the other, and the meaſures of the proportions of the one a mean for obtaining a meaſure of the proportions of the other. In this point of view, the relation of preſſure to motion, as the meaſure of the force of percuſſion, *reſembles* that of fluxion and fluent, but is not the ſame.

Much has been ſaid by the partizans of Mr Leibnitz about the incomparableneſs of preſſure and percuſſion, and many experimental proofs have been adduced of the incomparable ſuperiority of the latter. Bulfinger ſays, that the preſſure of many tons will not cauſe a ſpike to penetrate a block of hard oak half ſo far as it may be driven by a weak man with one blow of a mallet; and that a moderate blow with a ſmall hammer will ſhiver to powder a diamond, which would carry a mountain without being hurt by its preſſure. Nay, even Mr Camus, of the Academy of Paris, a ſtaunch Carteſian, and an eminent mechanician, ſays that he beat a leaden bullet quite flat with a hammer of one pound weight, without much force; and that he found that 200 pounds weight would not have flattened it more than this blow: and he concludes from thence, that the force of the blow exceeded 200 pounds. Theſe, to be ſure, are remarkable facts, and juſtify a more minute conſideration of a power of producing certain effects, which is ſo frequently and ſo uſefully employed. But, at the ſame time, theſe are all very vague expreſſions, and they do not authoriſe any preciſe concluſions from them. Mr Camus ſaying "without much force," makes his pound weight, and his 200 pound weight, of no uſe for determining the force of the blow. He would have given more preciſe and applicable data for his deciſion, had he told us from what height the hammer ſhould fall in order to flatten the bullet to this degree. But even then we ſhould not have obtained any notion of the force in actual exertion during the flattening of the bullet; for the blow which could flatten the bullet in a longer or a ſhorter time, would unqueſtionably have been leſs or greater.

All the paradoxes, obſcurities, and puzzling difficulties, in this ſubject diſappear, if we leave out of our conſideration that unintelligible force, which is ſuppoſed to preſerve a body in motion or at reſt; and if we conſider both of theſe ſtates of body as conditions which will continue, unleſs ſome adequate cauſe operate a change; and if we farther grant, that ſuch cauſes do really exiſt in the univerſe, however unknown their nature may be by us; and, laſtly, if we acknowledge, that the phenomena of elaſticity, expanſiveneſs, coheſion, gravity, magnetiſm, electricity, are indications of the agency of ſuch cauſes, and that their actual exertions, and the motions and changes conſequent on theſe exertions, are ſo invariably connected with particular bodies, that they always accompany their appearance in certain mutual relations of diſtance and poſition:—if we proceed thus, all the phenomena of colliſion will be explained by theſe cauſes alone, without ſuppoſing the exiſtence and agency of a cauſe diſtinct from them all, and incomparable with them, called the FORCE OF PERCUSSION.

For it has been ſufficiently demonſtrated in the article IMPULSION *(Suppl.)*, that that property of tangible coherent matter, which we call *perfect elaſticity*, operates as a preſſure during a certain ſmall portion of time on both bodies, diminiſhing more and more the motion of the one, and augmenting that of the other, as the compreſſion of one or both increaſes, till at laſt they ſeparate with ſenſible velocities. In ſome very ſimple or perſpicuous caſes, we know what this preſſure is in every inſtant of the action. We can tell how many pounds weight, at reſt, will exert the ſame preſſure. We can tell the whole duration of this preſſure, and the ſpace along which it is exerted; and, in ſuch a caſe, we can ſay with preciſion what motion will be generated by this continued and varied preſſure on the body which was at reſt, and what diminution will be made in the motion of the other. All this can be done in the caſe of a ball A (fig. 1.), moving like a pendulum with a Plate XLI. ſmall velocity, and ſtriking a ſlender elaſtic hoop B, alſo ſuſpended like a pendulum. We can aſcertain by experiment, before the colliſion, what preſſure is neceſſary for compreſſing it one inch, one-half, one-fourth, &c. Knowing this, and the weight of the hoop, and the weight and velocity of the ball, we can tell every circumſtance of the colliſion—how long the compreſſion continues—what is the greateſt compreſſion—how far the bodies have moved while they were acting on each other—and what will be the final motion of each:—in ſhort, every thing that affords any mark or meaſure of a force of percuſſion. And we know that all this is produced by a force, familiarly known to us by the name of elaſticity. Which of all theſe circumſtances ſhall be called the percuſſion, or the force of percuſſion? Is it the ultimate or greateſt preſſure occaſioned by the compreſſion? This cannot be, becauſe this *alone* will not be proportional to the final change of motion, which is generally taken as a meaſure of the percuſſion when a change of motion is its only obſerved effect.

We know that another perfectly elaſtic body, of the ſame weight, and ſtruck by the ſame blow, and acquiring the ſame final velocity by the ſtroke, may not have ſuſtained the tenth part of the preſſure, in any one inſtant of the colliſion, if it has only been much more compreſſible. The greateſt mutual preſſure in the colliſion of a billiard ball is perhaps 1000 times greater than it is in a ſimilar colliſion of a foot-ball of the ſame weight.

We alſo know what degree of compreſſion will break this hoop, and what preſſure will produce this compreſſion. Therefore, ſhould the fracture of the body be conſidered as the mark and meaſure of the percuſſion, we know what blow will juſt produce it, and be exhauſted by ſo doing. In ſhort, we know every mark and meaſure of percuſſion which this hoop can exhibit.

We can increaſe the ſtrength of this hoop till it becomes a ſolid diſk; and we ſee clearly, that in all theſe forms the mode of acting is the ſame. We ſee clearly that it is the ſame when, inſtead of the ſolid diſk, it is an elaſtic ball; therefore every thing that can indicate or meaſure the percuſſion of an elaſtic ball, is explained without the operation of a peculiar force of percuſſion, even when the ball is ſhivered to pieces by the blow.

Nor is the caſe materially different when the bodies are ſoft, or imperfectly elaſtic. When the ſtruck body is uniformly tenacious, it oppoſes a uniform reſiſtance to penetration, and its motion will be uniformly accelerated by the action of its own tenacity during the whole time of mutual action, except a trifling variation occaſioned by the mere motion of the internal parts, independent of their tenacity. If we knew the weight neceſſary for merely penetrating this maſs, and the weight and velocity of the penetrating body, we can tell how long it muſt be reſiſted by this force before its initial velocity will be annihilated, and therefore how far it will penetrate. We have tried this with deal, birch, willow, and other ſoft woods of uniform texture, and with nails having the body ſomewhat ſlenderer than the end, that there might not be an irregularity occaſioned by a friction on the ſides of the nail, continually increaſing as the penetration advanced. We made the hammer fall from a conſiderable height, and hit the nail with great accuracy in the direction of its length, by fixing it to the end of a long lath, moveable round an axis. The reſults correſponded with the calculation with all the preciſion that could be deſired.

But it does not reſult from all this agreement, that the force, exertion, or effect, of a blow with a hammer is equal to the preſſure of any number of pounds whatever. They are things that cannot be compared; and yet the force operating in the penetration by a blow is no way different from a preſſure. It is a phyſical blunder to compare the area of the curve, whoſe abſciſſa is the depth of penetration, and the ordinates are as the reſiſtances, with any preſſure whatever. This area expreſſes the ſquare of a velocity, and its ſlips, bounded by parallel ordinates indefinitely near each other, are as the decrements of this ſquare of a velocity, occaſioned by a preſſure, acting almoſt uniformly along a very ſmall ſpace, or during a very ſmall time. It is an abſurdity therefore to ſum up theſe ſlips as ſo many preſſures, and to conſider the ſum total as capable of expreſſing any weight whatever. Such a paralogiſm is peculiar to Leibnitz's way of conceiving his infiniteſimal method, and it could have no place in the genuine method of fluxions. It is this miſconception that has made Mr Leibnitz and his followers ſuppoſe that a body, accelerated by gravity, retains in it a ſum total of all the preſſures of gravity accumulated during its fall, and now forming a *vis viva*. Suppoſing that it requires a preſſure of twenty pounds to preſs a ſix-pound ſhot ſlowly through a maſs of uniformly reſiſting clay; this preſſure would carry it from the top to the bottom of a mountain of ſuch clay. Yet this ball, if diſcharged horizontally from a cannon, would penetrate only a few yards, even though the clay ſhould reſiſt by tenacity only, independent of the motion loſt by giving *motion* to its internal parts. In this experiment, the utmoſt preſſure exerted during the motion of the ball did not much exceed the preſſure of twenty pounds. In this compariſon, therefore, percuſſion, ſo far from appearing infinitely greater than preſſure, would appear much leſs. But there is perhaps no body that reſiſts penetration with perfect uniformity, even though uniformly tenacious. When the ball has penetrated to ſome depth, the particles which are before it cannot be ſo eaſily diſplaced, even although they had no tenacity, becauſe the particles adjoining are more hemmed in by thoſe beyond them. We have always obſerved, that a ball impelled by gunpowder through water riſes toward the ſurface (having entered horizontally through the ſide of the veſſel at ſome depth), and this ſo much the more rapidly as it entered nearer to the ſurface. The reaſon is plain. The particles which muſt be diſplaced before the ball, eſcape more eaſily upwards than in any other direction. It is for this reaſon chiefly that a greater weight laid on the head of a nail will cauſe it to ſink deeper into the wood; and thus a great weight appears to be commenſurable with a great force of percuſſion. Alſo, while a bullet is flattening more and more under a hammer during the progreſs of a blow, it is ſpreading under the hammer; more particles are reſiſting at once, and they find more difficulty in effecting their eſcape, being harder ſqueezed between the hammer and the anvil. The ſame increaſed reſiſtance muſt obtain while it is flattening more and more under the quiet preſſure of a weight; and thus, too, a greater weight appears to be commenſurable with a greater blow.

After all, however, a blow given by a falling body muſt excite a preſſure greater than its mere weight can do, and this in any degree. Thus, ſuppoſe AB (fig. 2.) to repreſent a ſpiral ſpring in its natural unconſtrained dimenſions, ſtanding upright on a table. Let ab be the abſciſſa of a line $adhk$, whoſe ordinates cd, gh, ik, &c. are as the elaſtic reaction of the ſpring when it is compreſſed into the lengths cb, gb, ib, &c. Suppoſe that, when it is compreſſed into the form CD, it will juſt ſupport the weight of a ball lying on C. Then cd will be a reaction equal to the weight of the ball, and the rectangle $acdf$ will expreſs the ſquare of the velocity which this ball would acquire by falling freely through ac. If therefore the ball be gently laid on the top of the ſpring at A, and then let go, it will deſcend, compreſſing the ſpring. It will not ſtop when the ſpring has acquired the form CD, which enabled it to carry the weight of the ball gently laid on it. For in this ſituation it has acquired a velocity, of which the ſquare is repreſented by the figure adf (See Dynamics, *Suppl.* n° 95.). It will compreſs the ſpring into the length gb, ſuch that the area $cghd$ is equal to the area adf. If the ball, inſtead of being gently laid on A, be dropped from M, it will compreſs the ſpring into ſuch a length ib, that the area aik is equal to the rectangle $mcdn$; and, if the ſpring cannot bear ſo great compreſſion, it will be broken by this very moderate fall.

Thus we ſee that a blow may do things which a conſiderable preſſure cannot accompliſh. The accounts which are given of theſe remarkable effects of percuſſion, with the view of impreſſing notions of its great efficacy, are generally in very indefinite terms, and often without mentioning circumſtances which are acceſſory to the effect. It would be very unfair to conclude an almoſt infinite power of percuſſion, from obſerving, that a particle of ſand, dropped into a thick glaſs bottle which has not been annealed, will ſhiver it to pieces. When Mr Bulfinger ſays that a moderate blow will break a diamond which could carry a mountain, he not only ſays a thing of which he cannot demonſtrate the truth, and which, in all probability, is not true; but he omits noticing a circumſtance which he was mechanician enough to know would have a conſiderable ſhare in the effect. We mean the rapidity with which the excited preſſure increaſes to its maximum in the caſe of a blow. In the experiment in queſtion, this happens in leſs than the millionth part of a ſecond, if the velocity of the hammer has been ſuch as a man would generate in it by a very moderate exertion. For the blow which will drive a good lath nail to the head in a piece of ſoft deal with an ordinary carpenter's hammer, muſt be accounted moderate. This we have learned by experiment to be above 25 feet per ſecond. The connecting forces exerted between the particles of the diamond may not have time ſufficient for their excitation in the remote parts, ſo as to ſhare the derangement among them all, in ſuch a manner that it may be ſo moderate in each as not to amount to a diſunion in any part of the diamond. We ſee many inſtances of this in the abrupt handling of bodies of tender and friable texture. It is partly owing to this that a ball diſcharged from a piſtol will go through a ſheet of paper ſtanding on edge without throwing it down, which it would certainly do if thrown at it by the hand. The connecting forces, having time to act in this laſt caſe, drag the other parts of the paper along with them, and their union is preſerved. Alſo, when a great weight is laid on the diamond, it is gradually dimpled by it; and thus incloſing many parts together in the dimple, it obliges them to act in concert, and the derangement of each is thus diminiſhed.

We flatter ourſelves that the preceding obſervations and reflections will contribute ſomewhat towards removing the paradoxes and myſteries which diſcredit, in ſome degree, our mechanical ſcience. If we will not pertinaciouſly conjure up ideal phantoms, which, perhaps, *cannot* exiſt, but content ourſelves with the ſtudy of that tangible matter which the Author of Nature has preſented to our view, we ſhall have abundant employment, and ſhall perceive a beautiful harmony thro' the whole of natural operations; and we ſhall gradually diſcover more and more of thoſe mutual adaptations which enable an atom of matter, although of the ſame preciſe nature wherever it is found, to act ſuch an unſpeakable variety of parts, according to the diverſity of its ſituations and the ſcene on which it is placed. If a mind be "not captivated by the harmony of ſuch ſweet ſounds," we may pronounce it "dark as Erebus, and not to be truſted."

PERDIDO, a river and bay on the coaſt of Weſt Florida. The mouth of the river is about 10 leagues eaſtward of Mobile Point, and 4 weſtward of the bar of Penſacola. The entrance is narrow, with a bar of ſix feet, but afterwards it widens conſiderably. This was formerly the boundary between Florida and Louiſiana, dividing the French and Spaniſh dominions. The river ſtretches in one place north-eaſt, where it goes within a mile of the great lagoon weſt of the entrance of Penſacola harbour.—*Morſe*.

Peres,
‖
Perkiniſm.

PERES *Iſland*, or *Conſtantine Peres*, on the coaſt of Chili, S. America. It is oppoſite to Port Coral. On this iſland is a fort called Manſera, and on the back of the iſland there is an entrance for boats into the harbour of Baldivia.—*ib.*

PERFECT Number, is one that is equal to the ſum of all its aliquot parts, when added together. Eucl. lib. 7, def. 22. As the number 6, which is $= 1 + 2 + 3$, the ſum of all its aliquot parts; alſo 28, for $28 = 1 + 2 + 4 + 7 + 14$, the ſum of all its aliquot parts. It is proved by Euclid, in the laſt prop. of book the 9th, that if the common geometrical ſeries of numbers 1, 2, 4, 8, 16, 32, &c. be continued to ſuch a number of terms, as that the ſum of the ſaid ſeries of terms ſhall be a prime number, then the product of this ſum by the laſt term of the ſeries will be a perfect number.

PERGUNNA, in Bengal, the ſubdiviſion of a diſtrict

PERICA, three iſlands in the bay of Panama, S. America; which give ſhelter to ſhips out of the command of the town of Panama.—*Morſe.*

PERITAS *Iſlands*, on the Spaniſh Main, coaſt of S. America, 3 leagues weſtward of Cumana Bay.—*ib.*

PERKINISM, the proper name of what we muſt think an impoſition attempted to be put upon the world by Dr Perkins of North America.

Though the phenomena of electricity had been long familiar to the philoſophers of Europe, it is well known that a philoſophical theory of theſe phenomena was firſt formed by a tranſatlantic philoſopher. In like manner, though the diſcovery of Galvani, under the name of *animal electricity* (ſee Galvanism in this *Supplement)*, had occupied the attention of many of the firſt phyſicians and philoſophers of the old world, it was reſerved for a phyſician of the new, to apply it to the cure of a number of diſeaſes. Every philoſopher of America, however, has not the ſagacity of the Philadelphian ſage; nor muſt Dr Perkins or his admirers be ſurpriſed, if we treat not incomprehenſible myſticiſm with the reſpect due to a theory founded on facts.

We are told by the ſon (A) of this rival of Franklin, that before the news of Galvani's diſcovery had reached America, he had obſerved ſeveral phenomena pointing out the influence of metals in caſes of pain. The firſt remarkable incident that preſented itſelf to his notice was the ſudden contraction of a muſcle when he was performing a chirurgical operation. This, he obſerved, regularly took place whenever the point of the metallic inſtrument was put in contact with the muſcle. Struck with the *novelty* of the appearance (Is Mr Perkins ſure that the appearance was new?), he was induced to try the points of wood and other ſubſtances; and no contraction taking place on theſe experiments, he thence inferred that the phenomena could be aſcribed only to the influence of the metal. About the ſame time, he obſerved that, in one or two caſes (and if his practice had been great he might have obſerved that in a thouſand caſes), a ceſſation of pain had enſued when a knife or lancet was applied to ſeparate the gum from a tooth previous to extracting it; and in the ſame year he diſcovered, that *momentary* eaſe was given, in a few inſtances, by the accidental application of a metallic inſtrument to inflamed and painful tumours previous to any inciſion.

Theſe are the judicious reaſonings and aſſertions of a dutiful child, who, having probably heard of Leibnitz's claims to ſome of Newton's diſcoveries, was determined to put in a ſimilar claim for his father, to a *ſhare*, at leaſt, of the diſcovery made by the celebrated profeſſor at Bologna. He has not, however, copied with ſervility the conduct of the Leibnitzians. We do not remember an inſtance where any of them attempted to elevate the fame or the merits of their maſter *above* the fame and merits of Newton; but, according to our author, the purſuits of Galvani and his European pupils ſink into inſignificance, when compared with thoſe of the tranſatlantic phyſician.

This is evident; for when the phyſiologiſts of Europe were engaged in experimenting on the denuded nerves and muſcles of the ſmaller animals, with a view to aſcertain the agency of this incomprehenſible property in them, Dr Perkins was proſecuting a ſeries of experiments, which conſiſted in applying externally, to parts affected with diſeaſe, metals, and compounds of metals of every deſcription which occurred to him, and conſtructed into various forms and ſizes. The reſult proved, that on drawing lightly over the parts affected certain inſtruments, termed *tractors*, which he formed from metallic ſubſtances into pointed ſhapes, he could remove moſt of thoſe topical diſeaſes of the human body, where an extra degree of nervous energy or vital heat was preſent; unleſs ſuch diſeaſe was ſituated in ſome of the internal viſcera, too remote from the part where the inſtruments could be applied.

The diſeaſes which have been found moſt ſuſceptible of the influence of the tractors are, rheumatiſm, ſome gouty affections, pleuriſy, ophthalmias, eryſipelas, violent ſpaſmodic convulſions, as epileptic fits and the locked jaw, the pain and ſwelling attending contuſions, inflammatory tumors, the pains from a recent ſprain, the painful effects of a burn or ſcald, pains in the head, teeth, and indeed moſt kinds of painful topical affections, excepting where the organic ſtructure of the part is deſtroyed, as in wounds, ulcers, &c. and excepting alſo where oils or ſome other non-conducting ſubſtances are preſent.

But we have other teſtimonies than thoſe of Dr Perkins and his ſon for the influence of the tractors. Mr Meigs, profeſſor of natural philoſophy at Newhaven, in a letter on Dr Perkins's diſcovery, conceives the principles of metallic irritability as ſo little underſtood, that he will not pretend to explain how the tractors produce their effects; but ſeems ſatisfied in finding that the effects are produced. After ſtating an experiment on his own child, eight years of age, very dangerouſly ill with a peripneumonic complaint, and to which the tractors gave almoſt inſtantaneous relief, he ſays, "I have uſed the tractors with ſucceſs in ſeveral other caſes in my own family; and although, like Naaman the Syrian,

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(A) See a pamphlet, entitled The Influence of Metallic Tractors on the Human Body, &c. by Benjamin Douglas Perkins, A. M. ſon to the diſcoverer; or a very good abridgement of it in the firſt volume of the Philoſophical Magazine.

rian, I cannot tell why the waters of Jordan ſhould be better than Abana and Pharpar, rivers of Damaſcus; yet, ſince *experience* has proved them ſo, no reaſoning can change the opinion. Indeed, the cauſes of all common facts are, *we think*, perfectly well known to us; and it is very probable, fifty or an hundred years hence, we ſhall as well know why the metallic tractors ſhould in a few minutes remove violent pains, as we now know why cantharides and opium will produce oppoſite effects: viz. we ſhall know but *very little* about either, excepting *facts*."

Mr. Woodward, profeſſor of natural philoſophy at Dartmouth, in a letter alſo on the ſame ſubject, has ſtated a number of ſucceſsful experiments in pains of the head, face, teeth, and in one caſe of a ſprain.

Dr Vaughan, a member of the Philadelphia medical ſociety, has lately publiſhed an ingenious tract on Galvaniſm, the object of which is to account for the influence of the tractors in removing diſeaſes. After a citation of numerous experiments made on the nerves and muſcles of animals, he obſerves, "If we only take an impartial view of the operations of Nature herſelf, and attend diligently to the analytical inveſtigations of the aforementioned experimentaliſts on this ſublime ſubject, I think the ſceptic muſt admit that the principle of nervous energy is a modification of electricity. As ſenſation is dependant on this energy, a pleaſurable ſenſation, or what may be termed a natural or healthy degree thereof; then certainly pain, or ſuperſenſation, can only depend on an accumulation of the electric fluid, or extra degree of energy in the part affected. On this principle the problem admits of eaſy ſolution; namely, that the metals, being ſuſceptible of this fluid, conduct the extra degree of energy to parts where it is diminiſhed, or out of the ſyſtem altogether, reſtoring the native law of electric equilibrium."

We truſt we are not ſceptics; and yet we feel not ourſelves inclined to admit any part of this theory. We have ſeen no proof that nervous energy is a modification of electricity; and we think that we have ourſelves proved, that *galvaniſm* and *electricity* are in many reſpects different; but we ſhall not be much ſurpriſed if we ſoon ſee a *demonſtration* by ſome American or German philoſopher, that the ſoul of man is a compoſition of ſilver and zinc. One of theſe ſages has lately diſcovered, that the ſymptoms of *putrefaction* do not conſtitute an *infallible* evidence of death, but that the application of *metals* will in all caſes aſcertain it beyond the poſſibility of doubt! A proper application certainly will; for when the Perkiniſt is doubtful whether his patient be dead or alive, he has only to apply the muzzle of a loaded piſtol to his temple, and blow out his brains; after which he may ſafely ſwear that the man is dead.

From the *Philoſophical Magazine*, we learn that Profeſſor Schumacher at Copenhagen made experiments with tractors of braſs and iron on ten patients in Frederick's hoſpital at Copenhagen. He tried alſo tractors of ebony and ivory, which are ſaid to have cured a pain in the knee; with others of ſilver and zinc; and ſome of copper and lead. By the two laſt, pains in the knee, arm, and face, are ſaid to have been mitigated. According to M. Klingberg's experiments, this remedy was of uſe in *malum iſchiaticum*; and according to thoſe of M. Steffens, in *malum iſchiaticum* and megrim. According to M. Bang, the pains in ſome caſes were increaſed, and in others allayed. According to M. Blech, the tractors were of uſe in *hemicrania* and gouty pains in the head; and, according to M. Hahn, in rheumatic pains in both ſhoulders. The principal document in the Daniſh collection relating to Perkiniſm, appears to be a letter of Profeſſor Abilgaard, in whoſe opinion Perkins's tractors will never acquire much value in medicine, and ſcarcely even have the merit of being a palliative; but, in a phyſical point of view, he thinks they deſerve the attention of phyſicians, and particularly of phyſiologiſts. Mankind (he ſays) hitherto have paid too little attention to the influence which electricity has on the human body; otherwiſe they would know that the effects produced on it by our beds is no matter of indifference. If the feather beds and hair matreſſes, &c. are perfectly dry, the perſon who ſleeps on them is in an inſulated ſtate; but the contrary is the caſe if they are moiſt. He three times removed a pain in the knee, by ſticking the tractors, one on each ſide of the knee, ſo deep through the ſtockings that the points touched the ſkin. He removed a rheumatic pain in the head from a lady by the ſame means. M. Kafn, by the tractors, relieved, in others, gouty pains of the head and megrim; and in himſelf, a rheumatic pain of the back, which, according to his ſenſations, was like a conſtriction in the cellular tiſſue. M. Herholdt, from his experiments, conſiders the effect of the tractors as indefinite and relative as that of other remedies. He, however, ſaw relief given by them in the ſtrangury in a caſe of ſyphilis. M. Bang alſo, at Soroe, freed a man from a violent gouty pain in the thigh, by drawing the tractors 200 times over the affected part. M. Jacobſen likewiſe found benefit derived from theſe tractors ſeveral times in the common hoſpital at Copenhagen. M. Tode tried them alſo in rheumatic pains, tooth-ache, and inflammation of the eyes; and obſerved that they neither did good nor harm.

On ſome of the atteſted cures mentioned in Mr Perkins's pamphlet, an able writer in the Monthly Review has made remarks ſo very pertinent, that we cannot refuſe ourſelves the pleaſure of tranſcribing them.

"At page 54 of the pamphlet, we meet (ſays the reviewer) with a ſtrong proof of the confidence placed in this remedy by ſeveral tranſatlantic philoſophers. Dr Willard, it ſeems, applied a red-hot piece of iron to a wart on his finger, and burnt himſelf very ſeverely, in order that he might be relieved by the tractors; which are ſaid to have given him eaſe in two ſucceſſive experiments. The author adds, 'many have ſubmitted to ſimilar meaſures, in order to *experience* the effects. I once formed one of five, who burned ourſelves ſo that bliſters were raiſed, to make the experiment; we all obtained relief in a few minutes.'

"This zeal for knowledge is truly edifying; eſpecially as the tractors are generouſly preſented to the public at *only* five guineas a pair; and it is clear that one pair would ſuffice to cure all the burns and ſcalds of a large pariſh. Why are not ſuch luculent experiments repeated here? If Mr Perkins, or any admirer of the diſcovery, would ſubmit to have a red hot poker run into ſome part of his body not neceſſary to life (into *that part where honour's lodged*, according to Butler, for example), in any public coffee-houſe within the bills of mortality, and would afterward heal the wound in preſence of the company, in ten minutes, or in half as many hours, by means of the tractors, the moſt ſtony-hearted infidel could not reſiſt ſuch a demonſtration. Why trifle with internal inflammations, when ſuch an outward and viſible ſign might be afforded?

"Mr Perkins has taken ſome pains, in the firſt part of his pamphlet, to ſhew that the operation of his rods is not derived from animal magnetiſm. In our opinion, this is an unneceſſary piece of trouble in England, where there is a conſtant ſucceſſion of ſimilar pretenſions. The *virgula divinatoria*, and the *baguette* of the juggler, are the genuine prototypes of this myſtery. We were, indeed, rejoiced, on Dr Perkins's account, to find that the Connecticut Society had only denounced him as a Meſmeriſt: we trembled leſt he ſhould have been put into the inquiſitorial hands of the old women as a white witch."

This may be thought too ludicrous a treatment of a diſcovery which profeſſes to benefit mankind; but to have treated this diſcovery with ſeriouſneſs, would have degraded the profeſſion of a ſcientific critic. As if the very cures pretended to have been performed did not of themſelves throw ſufficient ridicule over the diſcovery, Mr Perkins informs us, "that in ſome inſtances the metallic influence, when excited by different perſons, produces different effects. Experiments made to aſcertain the point, proved that there were perſons who might uſe the tractors for any length of time, in diſeaſes which were ſuitable for the operation, and produce no perceptible effect; when by placing them in the hands of another perſon, who ſhould perform the operation preciſely in the ſame manner as before, the pain or inflammation would be removed directly." Hence he endeavours to prove that the influence of the tractors is Galvanic, by an argument as abſurd as the pretended fact on which it is founded.

"On the application (ſays he) of zinc and ſilver to the tongue, the ſenſation of taſte is very ſlight to ſome, while with others it is very ſtrong:—when the experiment is applied to the ſenſe of ſight, ſome are hardly ſenſible of it, while others obſerve a ſtrong flaſh." But, not to mention that neither ebony nor ivory can form part of the excitatory arc in *Galvaniſm*, though we have ſeen them both employed *ſucceſsfully* as tractors by a Daniſh Perkiniſt, it is enough to obſerve, that the different effects of the Galvanic metals on different perſons depend upon the difference of ſtructure of the organs of ſenſation in the *patients*; whereas the different effects of the metallic tractors reſult, according to this account, from the difference of ſtructure in the organs of ſenſe of the various *operators*! Nay, what is ſtill more extraordinary, if any thing can be more extraordinary than this, is, that the value of the tractors depends, not upon the *materials* of which they are made, or the *ſkill* of the manufacturer, but upon ſome inconceivable virtue conveyed by Mr Perkins to the *perſon* of him by whom they are *ſold*. This we learn from a pamphlet publiſhed by Charles Cunningham Longworthy, ſurgeon in Bath; who informs us, that he ſells tractors by *commiſſion* from Mr Perkins the original manufacturer in London."

After this article was ſent to the preſs, and thus much of it printed, we received, from a friend in London, a copy of Mr Perkins's laſt publication on the ſubject *; in which he endeavours to repel the objections urged by Dr Haygarth and others againſt the influence of the metallic tractors. Had we not been previouſly convinced of the falſity of Perkiniſm, the peruſal of this pamphlet would have removed from our minds every doubt; for we will venture to ſay, that it is not in the power of Dr Haygarth, and the whole faculty united, to bring more complete proof than Mr Perkins has here brought, that what he calls his father's *diſcovery* has no claim to rank otherwiſe than with the diſcovery of Meſmer. See *Animal* MAGNETISM, Encycl.

He gives indeed 250 caſes, which are atteſted to have been ſucceſsfully treated by the tractors; but at leaſt an equal number of caſes were atteſted to have been ſucceſsfully treated by Meſmer and his partiſans; and ſix times that number of cures were ſaid to have been miraculouſly performed at the tomb of the Abbé Paris (See PARIS in this *Suppl.*) We would willingly allow, however, that theſe atteſtations ought to draw the attention of men of ſcience to the ſubject, did not the author himſelf betray a want of confidence in the tractors, by his own arguments in their favour, and by his caution to the public againſt *counterfeits*. He ſeems indeed to conſider their ſanative influence as reſulting entirely from his *patent*.

Dr Haygarth having ſaid that he performed cures of the ſame kind with thoſe of which Mr Perkins boaſts, by the proper application of tractors made of *wood*; and having added, that "if any perſon would repeat theſe experiments, it ſhould be done with due ſolemnity," in order to work upon the imagination; our author replies, by putting the following queſtion: "Is there a ſingle poſſeſſor of the *patent metallic* tractors in England, who has frequently uſed them, and will ſay that this fraud is neceſſary to make *them* perform *cures*?" Inſtead of anſwering for the Engliſh poſſeſſors of theſe valuable inſtruments, we beg leave, in our turn, to aſk, if there be a ſingle expert chemiſt in Great Britain who can underſtand this queſtion in any other ſenſe, than as implying that the virtue of the tractors reſides in the *patent*? This, however, appears ſtill more palpable in the caution to the public.

"Among the various artifices (ſays Mr Perkins) which have been employed by certain intereſted perſons, I have to mention the mean attempt to circulate *falſe tractors*, and from the failure of theſe to throw diſcredit upon the diſcovery. Three inſtances of this kind have occurred lately. Complaints having been made to me that my tractors would not cure the diſeaſes for which they are recommended, I was led to make inquiry reſpecting the caſes alluded to; and conceiving them fit ſubjects for the tractors, I called on the patients to apply them myſelf. In *both* inſtances (it was juſt now in *three* inſtances) I found they had been uſing *counterfeit* tractors. Had not this been diſcovered, the *merit* of the *patent* tractors muſt have ſuffered extremely!"

This is very extraordinary. The *character* or *fame* of any thing may indeed be injured by a counterfeit; but we believe this is the firſt inſtance of the *merit* or *demerit* of one inanimate ſubſtance being increaſed or diminiſhed by another at a diſtance from it, of the hardneſs of ſteel, for inſtance, being diminiſhed by the ſoftneſs of lead! But we beg Mr Perkins's pardon. The *merit* of his tractors conſiſts in their putting money into his pocket; and *that* merit might certainly be injured by the uſe of *counterfeits*. Hence, with great propriety, he informs the public, that every *genuine ſet* is ſtamped with the words Perkins's patent tractors, accompanied with a receipt for the five guineas, numbered and ſigned in the handwriting of the patentee. From theſe facts we infer (and he muſt acknowledge the inference to be juſt), that the virtue of the tractors reſides in the *patent*, reſtricting the making of them to *Benjamin Douglas Perkins*, and not to the *metal* of which they are made. This is indeed moſt obvious; for he cannot be ſuch a ſtranger to the ſtate of chemical ſcience in this country, as to ſuppoſe that his tractors may not be analyſed into their component principles, and, of courſe, that others may not be made poſſeſſing all their virtues except ſuch as reſult from the patent.

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* *The Efficacy of Perkins's Patent Metallic Tractors, &c.* 1800.

We ſhall conclude this article in the words of the reviewer already quoted: "To trace the relations and dependencies of projects ſimilar to that of Dr Perkins, would now be a work of more labour than utility. The fund of public credulity is an inexhauſtible reſource for thoſe who can reſolve to levy contributions on it. In vain is the ſpirit of quackery exorciſed in one form; it riſes again immediately, 'with twenty ghaſtly murders on its head, to puſh us from our ſtools.' We, who have contemplated the progreſs of real knowledge during a long courſe of years, have ſeen many bubbles like this glitter for a moment, and then diſappear for ever. People may talk of Meſmeriſm, or Perkiniſm, but we conſider all ſuch varieties as belonging to the old and extenſive claſs of Charlataniſm."

PERKINS, *Port*, lies on the S. W. of Waſhington's Iſle, on the N. W. coaſt of N. America.—*Morse*.

PERKIOMIN, a townſhip of Pennſylvania, in Montgomery county.—*ib*.

PERLICAN, *Old*, an indifferent ſhip road with rocky ground on the E. coaſt of Newfoundland Iſland, 2 leagues S. W. by S. of Break Heart Point. Sherwick is the name of its N. point.—*ib*.

Perlican, *New*, a noted harbour on the E. coaſt of Newfoundland Iſland, 8 leagues W. S. W. of Old Perlican, and 5 leagues from Random Head. It has a wide and ſafe entrance, and ſhips may ride in it landlocked from all winds in from 10 to 5 fathoms water. —*ib*.

PERNAMBUCO, a captainſhip in the northern diviſion of Brazil, whoſe chief town is Olinda.—*ib*.

Pernambuco, or *Phernambuco*, otherwiſe called *Panambuco*, a place of conſiderable trade on the E. coaſt of Brazil, having a bay or harbour of the ſame name; ſituated between Paraiba on the N. and Cape St Auguſtine on the S. in lat. 8 S. and long. 35 W. Proviſions and other articles are brought hither from Para, and from hence great quantities of tobacco are ſent off to Europe.—*ib*.

Pernambuco, a river on the coaſt of Brazil, S. America, ſouthward of Tamerica Iſland. It is blocked up with ſand; and ſhips enter it from the northward, at the entrance of the Receif harbour, 3 leagues from it. S. lat. 8 30, W. long. 35 7.—*ib*.

PEROUSE (John Francis Galoup de la), the celebrated, though unfortunate, French navigator, was born at Albi in 1741. Of the rank or condition of his father, M. *Milet-Mureau* has given us no information in that meagre eulogy of Perouſe which he has inſerted in the introduction to his laſt voyage. It appears, however, that he intended to make his ſon a ſeaman, and ſent him, at a very early period of life, to the marine ſchool, where the young man became enthuſiaſtically fond of his profeſſion, and laudably ambitious to emulate the fame of the moſt celebrated navigators.

Being appointed a midſhipman on the 19th of November 1756, he behaved, we are told, with great bravery in that ſtation, and was ſeverely wounded in the engagement between the admirals Hawke and Conflans, on the 20th of November, 1759. The Formidable, in which he ſerved, was taken, after a vigorous reſiſtance; and it is probable that Perouſe reaped ſome advantage from his acquaintance with Britiſh officers.

On the 1ſt of October 1764 he was promoted to the rank of lieutenant; and deſpiſing a life of eaſe and idleneſs, he contrived to be employed in ſix different ſhips of war during the peace that ſubſiſted between Great Britain and France. In 1767 he was promoted to the rank of what, in the Britiſh navy, is called *maſter* and *commander*. In 1779 he commanded the *Amazone*, belonging to the ſquadron of Vice-admiral Count d'Eſtaing; and when that officer engaged Admiral Byron, the poſt of La Perouſe was to carry his admiral's orders to the whole of the line. He afterwards took the ſloop *Ariel*, and contributed to the capture of the *Experiment*—exploits which his eulogiſt ſeems to conſider as inſtances of very uncommon heroiſm; but he ſoon after performed a greater.

Being, on the 4th of April 1780, appointed captain of the frigate *Aſtrea*, and being on a cruiſe with the *Hermione*, theſe two frigates attacked ſix Engliſh veſſels of war, of from 28 to 14 guns each, and took two of them. The French certainly reaped more laurels about that period than they have been accuſtomed to do in naval wars with Great Britain; but as we have completely forgotten the particulars of this fight, we ſuſpect that it was not altogether ſo very brilliant a buſineſs as M. Milet-Mureau is pleaſed to repreſent it.

In the year 1782, La Perouſe was diſpatched with the Sceptre of 74 guns, and two frigates of 36 guns each, having ſome troops and field pieces on board, to deſtroy the Engliſh ſettlements in Hudſon's Bay. This taſk was eaſily accompliſhed; for when he had ſurmounted the difficulties of navigation in a frozen ſea, he found nothing on ſhore to oppoſe the ſmalleſt force. Having deſtroyed the ſettlements, he learned that ſome of the Engliſh had fled at his approach into the woods; and his eulogiſt conſiders it (ſuch are the diſpoſitions of French republicans) as a moſt wonderful inſtance of humanity, that he left to theſe unfortunate men proviſions to preſerve them from periſhing by hunger, and arms to protect them from the fury of the ſavages! Perouſe, we dare anſwer for him, was conſcious of nothing heroic or extraordinary in this act of beneficence, which he certainly could not have omitted, without incurring both infamy and guilt.

In the year 1785, he was appointed to the command of a voyage round the world; which was unfortunately deſtined to be his laſt. Of this voyage, as far as it was accompliſhed, there is a full account in the hands of every French and Engliſh reader; and from that account it appears, that Perouſe was admirably qualified to diſcharge ſuch a truſt. He ſeems to have been an experienced and ſkilful ſeaman; a man of conſiderable mathematical and phyſical ſcience, uncorrupted by that philoſophiſm which diſgraced many of his attendants; and capable of the utmoſt perſeverance in every laudable purſuit. To theſe qualities he united a proper combination of caution and courage, with a diſpoſition truly benevolent to the various tribes of ſavages whom he viſited. The diſaſters which occurred on the voyage were all, except the laſt, of which nothing is known, occaſioned by the diſobedience of his officers, or their neglecting to follow his advice.

The laſt diſpatches of this great and good man were dated from Botany Bay, February the 7th 1788; and ſince that period, no account of him has been received which is intitled to the ſmalleſt confidence. *M. Milet-Mureau* has indeed given us, at ſome length, the childiſh conjectures of the Society of Natural Hiſtory reſpecting his fate, which, in language equally childiſh, were delivered at the bar of the National Aſſembly; and he has added the ridiculous decree which that body of legiſlative ſcioliſts paſſed in conſequence of ſo extraordinary a ſpeech. We will not diſgrace our pages, or inſult the memory of Perouſe, by contributing to the circulation of nonſenſe, which, we are perſuaded, would have made him bluſh for his country.

PERPENDICULAR, in gunnery, is a ſmall inſtrument, uſed for finding the centre line of a piece in the operation of pointing it to a given object.

PERPETUA, *Cape*, on the north-weſt coaſt of N. America. N. lat. 44 6, W. long. 124 8. Variation of the compaſs in the year 1779, 17 50 E.—*Morse.*

PERQUIMONS, a county of Edenton diſtrict, N. Carolina, bounded W. by Chowan county, and E. by Paſquotank, from which laſt it is ſeparated by the river Paſquotank, a water of Albemarle Sound. It contains 5,440 inhabitants, of whom 1878 are ſlaves. —*ib.*

PERSIAN or Persic, in architecture, a name common to all ſtatues of men, ſerving inſtead of columns to ſupport entablatures.

PERSON, a new county in Hillſborough diſtrict, N. Carolina. The court houſe, where a poſt-office is kept, is 26 miles N. of Hillſborough, and 34 E. of Caſwell New Court-houſe.—*Morse.*

PERTH-AMBOY, a city of New Jerſey, pleaſantly ſituated in Middleſex county, at the head of Rariton Bay, and ſtands on a neck of land included between Rariton river and Arthur Kull Sound. Its ſcite is high and healthy. It lies open to Sandy Hook, and has one of the beſt harbours on the continent. Veſſels from ſea may enter it in one tide, in almoſt any weather. It is a port of entry and poſt town; but although it is admirably ſituated for trade, and the legiſlature has given every encouragement to induce merchants to ſettle here, it is far from being in a flouriſhing ſtate. It contains about 60 houſes, and carries on a ſmall trade to the W. Indies. Its exports for a year, ending 30th Sept. 1794, were to the value of 58,159 dolls. It is 35 miles ſouth-weſt of New York, and 74 north-eaſt of Philadelphia. N. lat. 40 35, W. long. 74 50. —*ib.*

PERU, a new townſhip of New York, in Clinton county, on the weſt ſide of Lake Champlain. It was taken from the towns of Plattſburg and Willſburg, and incorporated in 1792. It is an excellent tract of land, and ſettling faſt. In 1796, there were, of the inhabitants, 120 qualified electors.—*ib.*

PERWANNAH, in the language of Bengal, an order of government, or a letter from a perſon in authority.

PETAGUEL, a territory of S. America, in Brazil, bounded N. by Dele; E. by the S. Atlantic Ocean; S. by the captainſhip of Rio Grande; and W. by Tupuy. It contains mines of ſilver.—*Morse.*

PETAPA, one of the pleaſanteſt towns of Guatimala, in New Spain. It is ſituated at the weſtern extremity of the valley of Mexico, 25 miles S. E. of Guatimala. There is a rich ſugar plantation in its vicinity.—*ib.*

PETAWONTAKAS, an Indian nation formerly in alliance with the Hurons.—*ib.*

PETER's *Bank, St*, a large fiſhing ground off the S. end of Newfoundland Iſland, and extends from Cape Race to St Peter's Iſland, oppoſite Placentia, St Mary and Trepaſſy Bays. It is 1½ degrees of latitude in breadth on the W. ſide. From St Peter's Iſland it decreaſes as it approaches Race Point. It lies W. of the Great Bank, and has on the S. at a conſiderable diſtance, Green and Whale Banks, which are among the ſmalleſt on the coaſt. It has from 45 to 30 fathoms water on it.—*ib.*

Peter's *Bay, St*, on the S. coaſt of Cape Breton Iſland, having St Peter's Iſland at its mouth.—*ib.*

Peter's *Fort, St*, on the iſland of Martinico, in the Weſt Indies. N. lat. 14 44, W. long. 61 21.—*ib.*

Peter's *Harbour, St*, on the N. coaſt of the iſland of St John's, in the Gulf of St Lawrence, about 8 leagues W. of Eaſt Point. Weſt of it are Anguille Bay and Port Chimene.—*ib.*

Peter's *Haven, St*, on the E. coaſt of Labrador, lies round the S. E. point of Sadel Bay. N. lat. 56 30, W. long. 60 42.—*ib.*

Peter's *Iſland*, a ſmall iſle on the W. coaſt of St John's Iſland, near to, and N. by W. of, Governor's Iſland, in the narroweſt part of the ſtrait between New Brunſwick and St John's Iſland.—*ib.*

Peter's *Iſland, St*, or *St Pierres*, on the ſouthern coaſt of Newfoundland Iſland, lies S. S. W. of the S. E. point of Fortune Bay, and near to, and S. E. of, the S. point of Miquelon Iſland. N. lat. 46 46, W. long 56 17.—*ib.*

Peter's, *St*, one of the Virgin Iſles, in the Weſt Indies, dependent on Virgin Gorda.—*ib.*

Peter's, *St*, a harbour at the W. end of Sydney or Cape Breton Iſland, is a very commodious place for carrying on the fiſhery.—*ib.*

Peter's, *St*, a town at the ſouthern extremity of Cape Breton Iſland. It ſtands on an iſthmus about half a mile broad, which ſeparates the harbour of St Peter from the great lake of that name, alſo called Lake Labrador. It is about 10 miles N. E. of Point Toulouſe. To this harbour veſſels of the greateſt burden can come with ſafety. Before the American revolution, a great fiſhery was carried on here.—*ib.*

Peter, *Lake St*, a part of St Lawrence river, into which empty from the S. and E. Sorel river from Lake Champlain, the river St Francis, and ſome ſmaller rivers, from the N. W. The Maſquinonge, Omachis,

&c.

&c. enter the lake. The centre of the lake is 68 miles above Quebec, and 205 N. E. of Kingſton, at the mouth of Lake Ontario.—*ib.*

Peter's *Mountain*, in Pennſylvania, lies on Suſquehannah river, between Halifax and Harriſburg, in Dauphin county.—*ib.*

Peter *St* and *St Paul*, a river at the bottom of the gulf of Campeachy. Its branches form an iſland called Tabaſco. The bar at the mouth of the eaſtern branch admits ſmall veſſels. At flood there is from 2½ to 3 fathoms water, and very good anchorage within the bar.—*ib.*

Peter's, *St*, a pariſh of S. Carolina, in Beaufort diſtrict.—*ib.*

Peter's, *St*, one of the north-weſtern branches of Miſſiſſippi river, which it joins in lat. about 45 6 N. and long. 94 22 W.—*ib.*

Peters, a townſhip of Franklin county, Pennſylvania.—*ib.*

PETERBOROUGH, a poſt town in Hillſborough county, New Hampſhire. It was incorporated in 1760, and contains 861 inhabitants. It is 73 miles W. by S. of Portſmouth, 18 weſterly of Amherſt, 16 E. of Keene, and 366 from Philadelphia. N. lat. 42 51, W. long. 71 52.—*ib.*

PETERSBURG, a townſhip of New York, in Renſſelaer county, E. of the village of Troy, incorporated in 1793. In 1796 there were 512 of the inhabitants qualified electors.—*ib.*

Petersburg, a poſt town of Pennſylvania, in York county, 2 miles north of the Maryland line. It contains a Roman Catholic church, and about 80 houſes. It is 25 miles ſouth-weſt of York Town, 59 northerly of the Federal City, and 113 weſt by ſouth of Philadelphia. N. lat. 39 42 30, W. long. 77 4.—*ib.*

Petersburg, a ſmall town of Kentucky, ſituated in Woodford county, on the E. ſide of Kentucky river, 19 miles W. S. W. of Lexington, and 15 ſouth-ſouth-eaſt of Frankfort. It has a tobacco warehouſe, and a few dwelling houſes.—*ib.*

Petersburg, a poſt town of Virginia, and a place of conſiderable trade; ſituated in Dinwiddie county, on the ſouth-eaſt bank of Appamatox river, juſt below the falls, about 25 miles ſouth of Richmond. It contains about 300 houſes, built irregularly. The Free Maſon's Hall is a handſome building; there are ſeveral tobacco warehouſes, ſtores of dry goods, and ſome few neat and commodious dwelling houſes. This town is a corporation, and comprehends the village of Blandford, in Prince George's county, and Pawhatan, in Cheſterfield county, on the oppoſite ſide of the river. It contains 2,828 inhabitants, including 1,265 ſlaves. The ſituation of the town is low and rather unhealthy. From the inſpector's books it appears, that on an average for the laſt 10 years, the quantity of tobacco received here has conſiderably exceeded 20,000 hhds. per annum; and for the laſt three years the quantity of flour made in this town and within an hundred yards of it, has exceeded 38,000 barrels; at other mills within a few miles, 16,000 barrels per annum; to this add the flour made at the ſeveral country mills, and brought to this place for ſale, the whole quantity may ſafely be ſtated to exceed 60,000 barrels per annum. The whole exports of this town, valued at the uſual peace prices, amount to 1,389,300 dolls. beſides the value of peach and apple brandy, whiſkey, &c. not included. The Indian princeſs, Pocahontas, the daughter of king Powhatan, from whom deſcended the Randolph and Bowling families, formerly reſided at this place. It is 80 miles W. by N. of Norfolk, 159 S. by W. of Alexandria, and 303 ſouth-weſt by ſouth of Philadelphia. N. lat. 37 14, W. long. 78 8.—*ib.*

Petersburg, a very flouriſhing poſt town of Georgia, in Elbert county, in a pleaſant and healthful ſituation, on the point of land formed by the confluence of Broad with Savannah river. Several reſpectable merchants are ſettled in this town. It is 15 miles from Elberton, 20 N. by E. of Waſhington, 50 above Auguſta, 73 N. of Louiſville, and 836 from Philadelphia. N. lat. 33 46, W. long. 81 32.—*ib.*

PETERSBURGH (St), the capital of Ruſſia, is a city, of which a pretty full hiſtorical detail has been given in the *Encyclopædia*. It is introduced here merely on account of its police, which, according to the anonymous author of the life of Catharine II. has a very ſimple and competent organization, and deſerves to be adopted in other great capitals. Excepting the governor, whoſe office naturally extends to all objects of public welfare, the head police-maſter is the proper chief of the whole ſyſtem of police. His office takes in the great compaſs of this department, but confined to the general objects of public ſecurity and order. He is not here, as in ſome large towns, the formidable copartner of family ſecrets, and the inviſible witneſs of the actions of the private man. Under the head police-maſter is the police office, where ſit a police-maſter, two preſidents, the one for criminal, the other for civil caſes, and two conſulters, choſen from the burgher claſs. To this is committed the care to maintain decorum, good order, and morals: alſo it is its buſineſs to ſee to the obſervance of the laws, that the orders iſſued by government, and the deciſions of the courts of juſtice, are put in force. The attainment of theſe purpoſes is effected by the following mechaniſm:

The reſidence is divided into ten departments. Each of theſe has a preſident, appointed to watch over the laws, the ſecurity, and the order of his diſtrict. The duties and rights of this office are not leſs extenſive than important. A preſident muſt have exact knowledge of the inhabitants of his department, over which a ſort of parental authority is committed to him; he is the *cenſor morum* of his department; his houſe muſt not be bolted or barred by night or day, but muſt be a place of refuge, continually open to all that are in danger or diſtreſs; he himſelf may not quit the town for the ſpace of two hours, without committing the diſcharge of his office to ſome other perſon. The police commando (conſtables), and the watchmen of his department, are under his orders; and he is attended on all affairs of his office by two ſerjeants. Complaints againſt unjuſt behaviour in the preſident may be brought to the police office.

Each department is again divided into three, four, or five ſubdiviſions, called quarters, of which, in the whole reſidence, are 42. Each of theſe has a quarter-inſpector, in ſubordination to whom is a quarter-lieutenant. The duty of theſe police-officers is in harmony with that of the preſident, only that their activity is confined to a ſmaller circle. They ſettle low affairs and ſlight altercations on the ſpot, and keep a watchful eye on all that paſſes.

The number of the nightly watch in the city amounts to 500. They have their ſtations aſſigned them in watch-houſes at the corners of ſtreets: and, beſides their proper deſtination, are to aſſiſt in the taking up of offenders, and in any ſervice, by day or night, as their commanders ſhall require. Beſides theſe, for the execution of the police orders, and to act as patroles, there is alſo a commando of 120 men, who, in caſes of emergency, are ſupported by a company of koſaks, or a regiment of huſſars.

This machine, conſiſting of ſo many ſubordinate parts, preſerves in its orderly courſe that ſecurity and peace which excite the admiration of all foreigners. The activity of every individual member is unobſerved in the operation of the whole; and by ſuch a diſtribution alone is the attainment of ſo complicated an aim practicable.—All the quarter-inſpectors of a department repair every morning, at ſeven o'clock, to their inſpector's houſe, to lay before him the report of all that has happened in their quarters during the laſt 24 hours; and at eight o'clock, all the inſpectors bring together theſe ſeveral reports into the police-office, whereupon they firſt and immediately take into examination the caſes of perſons taken into cuſtody during the night. On urgent occaſions, the police-office aſſembles at all hours.

This organization, and the extraordinary vigilance of the police, which is found competent to the buſineſs of a numerous and reſtleſs people, render all ſecret inquiſitions unneceſſary. The police has knowledge of all perſons in the reſidence; travellers who come and go are ſubject to certain formalities, which render it extremely difficult to conceal their place of abode, or their departure from the city. To this end, every houſeholder and innkeeper is obliged to declare to the police, who lodges with him, or what ſtrangers have put up at his houſe. If a ſtranger or lodger ſtays out all night, the landlord muſt inform the police of it at lateſt on the third day of his abſence from his houſe. The cautionary rules, in regard to travellers quitting the town, are ſtill more ſtrict. Theſe muſt publiſh in the newſpapers their name, their quality, and their place of abode, three ſeveral times, and produce the newſpapers containing the advertiſement, as a credential in the government from which they then receive their paſſport; without which, it is next to impoſſible to get out of the empire. This regulation not only ſecures the creditor of the perſon about to depart, but alſo enables the police to keep a cloſer inſpection over all ſuſpected inhabitants.

If individuals may be ſuſpected by the government, becauſe their means of ſupport, the company they keep, and their whole courſe of action, are cloſely wrapped up in myſtery; ſo likewiſe may whole ſocieties be leſs indifferent to it, if they carefully conceal the object of their connection, or their very exiſtence, from the eye of the public. The police watches here, with laudable attention, over ſecret ſocieties of all kinds; and frequently as the fanatical ſpirit of religious or political ſectaries, or the enthuſiaſm of pretended myſtagogues, have attempted to neſtle here, they have never been able to proceed, or only for a very ſhort time. Animal magnetiſm, Martiniſm, Roſycrutianiſm, and by whatever other name the conceits of diſtempered imaginations may be called, have always been attended with the ſame bad ſucceſs on this ſtage.

From this ſketch it will be readily imagined, that the number of impoſtors and diſturbers of the public peace can be but ſmall. Quarrels and affrays in the ſtreet or in the cabaks but ſeldom happen. The perſon attacked calls the neareſt watchman; and in a moment both the aggreſſor and the aggrieved are taken into cuſtody, and led to the next fieja (police-watch-houſe), where the cauſe of their quarrel is inquired into, and the aggreſſor is puniſhed. For matters of ſome deſcriptions, there is a peculiar tribunal, under the denomination of the oral court, which, on account of its ſingularity, deſerves to be briefly noticed.

In each quarter of the town are one or more judges of the oral court, who are choſen from the claſs of burghers, and with whom are aſſociated a few jurats. This court ſits daily in the forenoon, and proceeds orally in all the differences that come before it. It, however, keeps a day-book, in which are entered all the cauſes and deciſions of the court, and which muſt be every week laid before the magiſtrate. When a charge is brought, the court declares it orally to the preſident of the quarter: whereupon the accuſed muſt not delay his appearance before the police longer than one day after he has received the ſummons. Every cauſe muſt be determined in one day, or, if the examinations require more time in collecting, in three days. The oral court communicates the deciſion to the preſident of the quarter by means of his day-book, in order to its ratification. If either party is not ſatisfied with the ſentence, he may appeal to the court as appointed in the regulations.

This is a very favourable account of the police of St Peterſburgh; but it is differently repreſented in *Beaujolin's Travels of two Frenchmen through Ruſſia*, in 1790—1792. According to him, the police of the capital of that empire is far from being on the moſt reſpectable footing. There happen, indeed, but few accidents in the night; yet ſometimes murders are committed, and eſpecially thefts; for which, according to our author, it is exceedingly rare to obtain juſtice. When a perſon has been aſſaſſinated in ſome place of bad repute, the police-officer is engaged to ſecrecy by means of a few rubles; ſo that the affair is ſoon huſhed up, unleſs the deceaſed belonged to ſome powerful family, whoſe intereſt makes it neceſſary that inquiries ſhould be inſtituted. When two perſons quarrel, either in the ſtreet or in a public-houſe, he who *pays* the inquirer is always in the right: the inferior police-officers are never proof againſt money; and the *poor* individual, whether he be in the right or wrong, is almoſt ſure of a beating.

PETERSHAM, a flouriſhing and pleaſant townſhip in Worceſter county, Maſſachuſetts, formerly called by the Indians *Nichewaug*; ſituated 28 miles N. W. of Worceſter, and 66 W. of Boſton. Swift river, a branch of Chickopee river, paſſes through this town. The ſoil is rich and fertile, and here are large and excellent orchards.—*Morſe.*

PETIT ANSE, a village on the north ſide of the iſland of St Domingo, 2½ leagues ſouth of Cape François.—*ib.*

PETITCODIAK, a river which falls into an arm of the Bay of Fundy, called Chegnecto Channel. The

Indians have a communication from the head of it with St John's river, by a portage acroſs to the head of Kennebecſius.—*ib.*

PETIT-GOUFRE, or the *Little Whirlpool*, in Miſſiſſippi river, is 31 miles from Fort Roſalie, and 4 miles from Bayouk Pierre, or Stony river.—*ib.*

PETIT-GUAVES, or *Goave*, a juriſdiction, town, and bay, on the N. coaſt of the S. peninſula of the iſland of St Domingo, and near the head of the Bay or Bite of Leogane. The juriſdiction contains 5 pariſhes, and is the unhealthieſt place in the colony, the inhabitants being conſtantly ſubject to fevers, occaſioned by the badneſs of the waters. Its dependencies, however, are healthy, and are remarkable for the culture of coffee. Its exports from January 1, 1789, to December 31, of the ſame year, were 27,090 lb. white ſugar—655,187 lb. brown ſugar—807,865 lb. coffee—50,053 lb. cotton, and 210 lb. indigo. The value of duties on exportation of the above, was 4,127 dollars 97 cents. The town lies on the E. ſide of the bay, 2½ leagues weſtward of Grand Guave, and 14½ W. by S. of Port-au-Prince: N. lat. 18 27, W. long. from Paris, 75 14. Some writers call the great bay, which is commonly called the Bay, Bight, or Bite of Leogane, by the name of Petit Guaves.—*ib.*

PETIT PORT, on the W. ſide of Newfoundland Iſland, towards the S. end; is about 5½ leagues N. of Cape Ray, and one S. of Anguille Cape. N. lat. 47 52 30, W. long. 59 15.—*ib.*

Petit Port, on the coaſt of Peru, otherwiſe called *Portete*, or *Little Port*, lies a ſhort way northward of the equator, and about 5 leagues to the S. E. within the bay from Cape Francis to Cape Paſſado on the S. by W. There is anchorage in 5 fathoms, and plenty of freſh water near the head land, which is high. It is neceſſary to ſound, on account of the ſand-banks, called the *Portetes.*—*ib.*

PETIT TERRE *Iſland*, near Deſeada, in the Weſt-Indies. N. lat. 16 14, W. long. 61 11.—*ib.*

PETITE RIVIERE, a ſmall town in the French part of the iſland of St Domingo, cloſe to the Spaniſh diviſion line 1½ leagues N. by N. W. of Varettes, and ſeparated from it by the river Artibonite; 10 leagues E. by N. of St Marc, and as far N. W. of Mirebalais. N. lat. 19 8, W. long. from Paris, 74 48.—*ib.*

PETIT TROU, is on the north ſide of the ſouth peninſula of the iſland of St Domingo, on the point of land which forms the eaſt ſide of the entrance into the Bay of Baradaires; 4½ leagues weſtward of Anſe a Veau, and 19 eaſterly of Jeremie.—*ib.*

Petit Trou, a ſmall cove on the ſouth ſide of the iſland of St Domingo, S. by W. of the mouth of Neybe river, and about 5 leagues N. E. of Beate Iſland. Small barks come to this place from St Domingo city, to fetch the meat, lard, and fowls derived from the chaſe.—*ib.*

PETIVER (James), a famous Engliſh botaniſt, was contemporary with Plukenet: but the exact time of his birth is not known, nor is much intelligence concerning him at preſent to be obtained. His profeſſion was that of an apothecary, to which he was apprenticed under Mr Feltham then apothecary to St Bartholomew's hoſpital*. When he entered into buſineſs for himſelf, he ſettled in Alderſgate-ſtreet, and there continued for the remainder of his life. He obtained conſiderable buſineſs, and after a time became apothecary to the charter houſe. After the Tradeſcants, he appears to have been the only perſon, except Mr Courten and Sir Hans Sloane, who made any conſiderable collection in natural hiſtory, previous to thoſe of the preſent day. He engaged the captains and ſurgeons of ſhips to bring him home ſpecimens, and enabled them to ſelect proper objects, by printed directions which he diſtributed among them. By theſe means his collection became ſo valuable, that ſome time before his death, Sir Hans Sloane offered him L. 4000 for it. After his death, it was purchaſed by the ſame collector. His muſeum extended his fame both at home and abroad. He was elected into the Royal Society; and becoming acquainted with Ray, aſſiſted him in arranging the ſecond volume of his Hiſtory of Plants. He died April 20. 1718; and much honour was ſhewn to him at his funeral, by the attendance of Sir Hans Sloane, and other eminent men, as pall bearers, &c. By future botaniſts, his name was given to a plant. See Petiveria, *Encycl.*

He gave the world ſeveral publications on various ſubjects of natural hiſtory: 1. *Muſei Petiveriani Centuriæ decem*, 1692—1703, 8vo. 2. *Gazophylacii Naturæ, et Artis, Decades decem*, folio, 1702, with 100 plates 3. A Catalogue of Mr Ray's Engliſh Herbal, illuſtrated with figures, folio, 1713, and continued in 1715. 4. Many ſmall publications, which may be found enumerated in Dr Pultney's book. 5. Many papers in the Philoſophical Tranſactions, and a material article in the third volume of Ray's work, entitled, *Plantæ Rariores Chinenſes Madraſpatanæ, et Africanæ, a Jacobo Petivero ad opus Conſummandum Collatæ*, &c. Many of his ſmaller tracts having become very ſcarce, his works were collected and publiſhed, excluſive of his papers in the Tranſactions, in 2 vols folio, and one 8vo. in the year 1764.

PETTQUOTTING, a river of the N. W. Territory, which empties into Lake Erie, from the ſouth, near Huron river.—*Morse.*

PHASIANUS (See *Encycl.*). A ſpecies of this genus of birds, formerly not deſcribed, was ſent from Batavia to England by Lord Macartney, or ſome of his attendants, when they were on their voyage to China. The ſpecies to which it ſeemed to be moſt nearly allied, in point of general habit or appearance, was the *phaſianus curviroſtris*, or Impeyan pheaſant; an Eaſt-Indian bird, deſcribed and figured both in Mr Latham's Ornithology, and in the Muſeum Leverianum. From that bird, however, it differs very conſiderably. The tail of the latter being in a mutilated ſtate, it was ſcarce poſſible to determine, with abſolute preciſion, whether it ſhould be referred to that ſubdiviſion of pheaſants, which contains thoſe with long or cuneiform tails, or thoſe with rounded ones, as in the Impeyan pheaſant. The general colour of this moſt elegant bird was black, with a gloſs of blue, or what, in the language of natural hiſtory, may be termed chalybean black, or black accompanied by a ſteel blue luſtre. The lower part of the back was of a peculiarly rich colour, which according to the different directions of the light, appeared either of a deep ferruginous or of the brighteſt fiery orange-red. This beautiful colour paſſed in the manner of a broad zone round the whole body; but on the abdomen was of a much more obſcure

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* Pultney's *Sketches of Botany in England.*

appearance than on the back, as well as ſomewhat broken or irregular, eſpecially on the ſides. The throat was furniſhed with a large, and ſomewhat angular, pair of wattles, uniting with the bare ſpaces on the cheeks. The feathers on the top of the head, which was of a lengthened form, ran a little backward, ſo as to give the appearance of an indiſtinct occipital creſt. The beak was remarkable for a more lengthened and curved aſpect than in any other bird of this genus, except the Impeyan pheaſant. The feathers on the neck, back, and breaſt, were rounded, and of the ſame ſhell-like or ſcaly habit as thoſe of the turkey. The legs very ſtout, and were armed with a pair of extremely ſtrong, large, and ſharp ſpurs. Both legs and beak were of a pale colour. Whether this bird be really new or not to the ornithologiſts of Europe, it may at leaſt be affirmed with ſafety, that it had never been properly deſcribed; nor can the character of any ſpecies, hitherto introduced into the books of any ſyſtematic naturaliſt, be conſidered as a juſt or competent ſpecific character of the preſent bird. It may be called the *fire backed pheaſant*; and its eſſential character may be delineated in the following terms: Black pheaſant with a ſteel-blue gloſs: the ſides of the body rufous; the lower part of the back fiery ferruginous; the tail rounded; the two middle feathers pale yellow brown.—*Sir George Staunton's Account of an Embaſſy to China, &c.*

PHILADELPHIA, a townſhip in Rutland county, Vermont, about 15 miles E. of Orwell. It contains 39 inhabitants.—*Morse.*

PHILIP, a large iſland in Lake Superior, in the territory of the United States. It lies towards the ſouth ſide of the lake, and ſouth-eaſt of Iſle Royal.—*ib.*

Philip's, *St*, a pariſh of S. Carolina, ſituated in Charleſton diſtrict.—*ib.*

Philip, *St*, a fort which commands the entrance of Maranhao harbour, on the coaſt of Brazil.—*ib.*

Philip, *St*, a point within the harbour of Port-Royal, S. Carolina.—*ib.*

PHILIPPEAU, an iſland on the north ſide of Lake Superior; N. of Iſle Royal.—*ib.*

Philippeau, a bay on the north ſhore of the gulf of St Lawrence, near the Straits of Belliſle, and partly formed by iſlands which project ſouthward on its eaſt part, and extend towards the weſt. The eaſt part of the bay lies in lat. 51 20 north, and long. 55 40 weſt.—*ib.*

PHILIPPINA, a ſmall town of the province of Guatimala, in New-Spain, ſituated on a bay of the N. Pacific Ocean. N. lat. 12 50, weſt long. 91 30.—*ib.*

PHILIPSBURG, a town of New-Jerſey, ſituated in Suſſex county, on the eaſt bank of Delaware river, oppoſite to Eaſton in Pennſylvania. It is 41 miles north-weſt of Trenton.—*ib.*

PHILIPSBURGH, or *Philipſtown*, a townſhip of New-York, in Dutcheſs county on the eaſt ſide of Hudſon's river, 28 miles above New-York, near the ſouth end of Tappan Bay. It contains 2,079 inhabitants, including 25 ſlaves. In 1796, there were 347 of the inhabitants electors. In this townſhip is a ſilver mine, which yields virgin ſilver.—*ib.*

PHILOPOLIS, a ſettlement in Luzerne county, Pennſylvania, 12 or 14 miles weſtward of Mount Ararat, and at the head of the weſtern branch of Tunkhanock Creek, about 45 miles ſouth-eaſt of Athens, or Tioga Point. N. lat. 41 40, weſt long. 75 33.—*ib.*

PHILOSOPHIST, a lover of ſophiſtry or falſe reaſoning, in contradiſtinction to *philoſopher*, who is a lover of ſound reaſoning, true ſcience, and practical wiſdom.

END OF THE SECOND VOLUME.

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